PUBLICATION OFFICES

168-177 POTTER BUILDING, NEW YORK.

Telephone Call: Murray 586. Cable Address: "Electrical," New York.

W. J. JOHNSTON, Editor and Publisher.

T. COMMERFORD MARTIN, } Associate Editors.
JOSEPH WETZLER, }
G. H. STOCKBRIDGE, Assoc. Editor Patent Department.
CLARENCE E. SUMP, Business Manager.
WALTER T. HUNT, Advertising Dept.

New England Office, 48 Congress Street, Boston.
W. I. BARKER, Manager.

Western Office, 44 Lakeside Building, Chicago.
C. H. MACLILIE, Manager.

SUBSCRIPTION, IN ADVANCE, ONE YEAR, $3.

(Postage Prepaid in the U. S. or Canada.)

CLUBS.—In clubs of 4 or more, $2.50 a year each; with a free extra copy to the getter-up of a club of 8.

Subscription to foreign countries, $4 a year.

In requesting your address changed, give old as well as new address.

THE ELECTRICAL WORLD HAS THE LARGEST CIRCULATION OF ANY ELECTRICAL JOURNAL PUBLISHED, AND IS THE BEST ADVERTISING MEDIUM.

W. J. JOHNSTON, Publisher,
Potter Building, New York.
OR EITHER OF THE BRANCH OFFICES.

Advertising Rates are much lower than those of any other similar publication, circulation and standing considered, and vary according to space, position and number of insertions. Quotations promptly furnished on application covering these points.

Notices of Situations or Help Wanted, $1 to $2 an issue.

Subscriptions and communications relating to Advertising or the Business Department should be addressed to

CONTENTS.

ILLUSTRATED ARTICLES:	PAGE.
A Large Storage Battery Plant	138
An Electric Furnace Generator	138
The Detroit, Mich., Edison Station	139
The New Waterhouse Dynamo	141
A New Dynamometer	142
An Important Patent on Multiple Arc Distribution.	143
Electrical Call Bell and Return Signal	144
The Brown Duplex Pin and Insulator	141
The Thomson-Rice Voltmeter	145
The Peyrusson Storage Battery	145
CORRESPONDENCE:	
Railway Bridge Protection.	138
Safety Signals for Bridges	141
EDITORIAL PARAGRAPHS	137
MISCELLANEOUS:	
Use of the Magnetic Bridge and the Results Obtained.	138
Transfer of the Baltimore & Ohio Property	139

MISCELLANEOUS:	PAGE
Lower Cable Rates	139
Telegraphers' Mutual Benefit Association	139
The Melting Platinum Standard of Light	140
Electric Lighting in a Sea Fog	143
Early Suggestions as to Electric Welding	141
Public Lighting in New York City	141
The Bad Odor of Arc Lights	141
The British Association Meeting at Manchester	145
DEPARTMENTS:	
New York Notes	145
New England Notes	146
Philadelphia Notes	146
Western Notes	147
The Telegraph	147
The Telephone	147
The Electric Light	147
Applications of Power	147
Personals	148
Miscellaneous Notes	148
Business Notices	148
Stock Quotations	148
Our Illustrated Record of Electrical Patents	148

New Advertisements.

In the growth of THE ELECTRICAL WORLD in circulation, size and general improvement, the value of its columns for reaching those engaged in electrical pursuits or interested in electrical matters has not failed to be appreciated by advertisers. Readers will find it to their advantage to keep their eyes on the advertising as well as the reading columns. The following are the new advertisements in this issue:

	PAGE
Hazzard & Stanley.—Electrical House Furnishing Apparatus	i
The Pume & Atwood Mfg. Co.—Brass, Copper and German Silver Wire, Telephone Bells etc.	x
E. P. Gleason Mfg. Co.—Electric Light Fittings and Appliances	x
The Phœnix Glass Co.—Arc and Incandescent Globes and Shades	xiii
Wants, For Sale and Special Notices	ix

VOL. X. NEW YORK, SEPTEMBER 10, 1887. No. 11.

ONE more cut in cable rates. Where will it end?

TELEPHONE experts in New York this week have been quietly discussing the best form of cable for their work. The topic is a good one, and vital in many respects.

THE electric motor gains ground so rapidly that it is hard to keep pace with all the new applications. One of the motors of recent commercial introduction is already in use in over 120 industries.

BY Jan. 1 next, no fewer than twelve theatres in Paris will be lit by electricity, in accordance with the recent municipal ordinance. It looks as though Paris will be pretty soon setting an example to New York, despite the much greater general use in this city of the electric light.

OUR interesting special cable dispatch with regard to the British Association meeting last week, at Manchester, shows that electricity was well represented in the proceedings, and is attracting more and more attention from the physicists, or "philosophers," as Faraday preferred to have it. We are glad to see that several well-known Americans were in attendance and participated in the discussions.

MR. E. P. ROBERTS contributes in this issue a pithy little note on his storage battery work at Cheyenne, in connection with the central station. It will be noted that the batteries play quite a leading part in certain kinds of work there.

It is worthy of note that Mr. Ellis Lever is again offering in England $2,500 as the prize for an electric safety lamp, and $2,500 for a perfectly safe, practical and efficient means of blasting without gunpowder. Here is an inviting chance for the acquisition of fame and money at the same time. The English Government has been asked to conduct the necessary tests, and will, we hope, accede to the proposition.

THE London daily papers have been discussing methods for the distribution of power, and our electrical contemporaries on the other side naturally call attention to the merits of electric motors and the work that is being done with them in America. Such a city as London ought to present a magnificent field for the utilization of the motor, which will certainly very soon come to the front there—probably in some degree through American enterprise.

THE ability of the telegraph messenger and operator to rise is again exemplified in the career of Mr. O. W. Stager who, honoring a well-known name, has passed from point to point and now is summoned from an important telegraphic position to take one of even larger responsibility in a new field, of which we make mention elsewhere. The number of old telegraphers scattered through the higher ranks of railway officials is very far from small. Some time ago we made a special summary of this interesting condition of affairs and are glad now to record another evidence of fitness for exacting duties.

WHILE the melting platinum standard of light adopted by the Paris Electrical Congress is excellent in theory, the objection which has been raised against it is, that it is difficult of practical application. It is well to note, therefore, that a practical device for the convenient application of this unit is in the course of development and gives promise of success. While, as a standard, the melting platinum is as reliable a one as could be devised, the old difficulty of the personal equation of the observer in photometrical measurements still exists, and hence, now that we have a standard far superior to the old candle, it becomes desirable to remove this last element of uncertainty.

ON another page Prof. J. B. Webb describes a new method of applying Prof. Brackett's "cradle" principle to the measurement of the power absorbed or given out by dynamo-electric machines and motors. The Brackett dynamometer, though admirable in conception, requires adjustments which involve some inconveniences, and it was to remove these that the new method was devised. In the new plan the machine is floated and the belt may be run at any desired angle. The machine can also be readily got at from any side, and another advantage gained is the ease with which the apparatus can be constructed, and its comparatively low cost. With this apparatus at their command, experimenters ought to have no difficulty in arriving at the value of their machines.

OUR columns this week again bear evidence of the fact that it requires but a suggestion in a new field to bring out the latent or still unpublished work of others. The most striking of the claims made in anticipation of Mr. Edison's pyromagnetic machine is the patent specification filed by Mr. Emile Berliner in the U. S. Patent Office over two years ago. While it differs somewhat in detail from Mr. Edison's generator, the essential principles exist in the Berliner apparatus. This only goes to show once more that two entirely independent workers can hit upon almost precisely the same idea. But it seems to us that there is a lesson to be learned from all this, and that is to publish at the earliest possible moment the work accomplished. Thus we know of one prominent inventor who, immediately after filing a patent in the Patent Office, publishes its contents, where these are of general interest. His object in doing so, as he states, is to secure as many "witnesses" as possible to his inventions, and to balk the inevitable prior claimant. We think that, within certain limits, this is a very good practice and ought to be followed more generally.

WE publish on another page a list of the additional contracts awarded for public lighting in New York. It will be observed that there are seven companies now in the business where before there were but two, and that rates have been cut from 70 cents per arc down to 19$\frac{3}{10}$ cents in some cases. Taking into account the 324 lights awarded some time since to the Brush Company at 25 cents, and a like number to the United States Company at 50 cents, a total of over 1,500 public arcs is reached. The price in several instances is pitiably low, but, at all events a marked extension has been given to the service, and it is likely that the effort will be made to get back to fair and normal prices. As those who are interested in supplying the lights are men of business, they will, we opine, at least try to secure hereafter an all-round rate equal to 50 cents per light. In view of the present low figures, it is a little singular that—after what Mayor Hewitt has said in favor of a general adoption of the electric light for public purposes—greater advantage was not taken of them. Some of the lights are unquestionably cheaper to the city than gas, on the most unfavorable basis of displacement, and hence the narrowness of the awards in some up-town districts, where the light is badly wanted, is well open to exception. New York is still far from the lead in the proportion of public lamps to inhabitants, but it is making a move in the right direction, and the authorities should not be slack in hastening the time when every thoroughfare will be lighted electrically, helping to make New York, as Mayor Hewitt has said in dealing with this very subject, the most desirable city in America to live in.

THE recent consummation of a Baltimore & Ohio "deal" after so many negotiations have been begun, discussed and abandoned, comes as a relief to everybody. The article we publish in another column gives the news in brief as to the transaction. The two most striking points brought out are that Mr. Garrett practically relinquishes the management of the great property, and that the capital advanced by the syndicate of bankers comes wholly from abroad. Mr. Garrett admits, in this step, that he has failed, but we do not think he deserves the censure leveled at him in various quarters. He has been the victim of his father's plans, which were on so large a scale that it took time to bring the inevitable disappointment and collapse. The elder Garrett aimed at establishing a vast railroad organization ramifying through the continent; a telegraph system equal to that of the Western Union Company; an express service as big as the biggest, and a palace car system equal to that of Pullman—and all under one management. That the younger Garrett has found the direction of all this beyond him is hardly discreditable, for he fails where scarcely any man living would have dreamed of success or tried to achieve it. In some of his decisions, Mr. Robert Garrett displayed admirable judgment, as, for example, in his choice of men to carry on the telegraph system, and in the few alliances that were possible as an offset to the countless antagonisms aroused. Mr. Garrett need not consider himself at the end of his career unless he so wishes, but will probably be able to make a better record when no longer handicapped with the burdens that were not of his own selection. The subject of interest just now, however, is not so much what becomes of Mr. Garrett as what will be done with the telegraph plant. It may pass into the possession of the Western Union Company, but not necessarily. There are other opportunities for its disposal and continuance, and one of them may be availed of.

Now and then the Patent Office grants patents of very broad sweep, but we are ready to give priority for all-embracing comprehensiveness to that which it has just issued to Mr. Edison, and of which we present all the essential details this week, together with reproductions of the drawings that accompanied the original application. This patent has a great many features of interest. The application dates back to 1880, and locates Mr. Edison at Mento Park, still engaged on the early work of developing his system. The language of the patent is quaint and archaic, and is in itself a revelation of the progress that was to be made. The method of exciting the successive fields, as shown, is almost amusing in its primitive ingenuity. But all these matters sink into insignificance beside the extraordinary scope given to Mr. Edison's claims on distribution. This patent, should it be sustained as it stands, secures to Mr. Edison a monopoly of the whole art and system of multiple arc distribution, and if we read aright, supplements that by the control of incandescent station operation. That is not enough, for on a modest interpretation "translating devices" must even include transformers when arranged in multiple arc. We know of no patent to compare—even at a distance—with this, in the electrical field to-day, except that on the Bell telephone and that which Mr. Brush secured on the storage battery. The fact that the patent is only now granted to Mr. Edison after seven years of delay forces us to believe that the patent office authorities must have gone over the ground very carefully and slowly—and yet that they could have been so critical may seem, in view of their final action, rather doubtful. Anyhow, there is the patent for what it is worth, and we should not be surprised to see the Edison Company make the most of it, unless it thinks that it has sufficient litigation on its hands now. That the company attaches some value to the patent may be inferred from the extension it is said to have obtained a little while ago on a number of European patents covering substantially the same claims, the shortest limitation being that for England, which would bring about an expiration here in 1895.

A Large Storage Battery Plant.

BY E. P. ROBERTS, M. E.

In THE ELECTRICAL WORLD of July 9, I notice that a plant of storage batteries in the Metropolitan Telephone Company's building in New York is stated to consist of 600 cells and to be the largest in the world. The size of the cells not being given I may be wrong in questioning thus the correctness of this statement, but we *now use*, here in Cheyenne, 310 cells of 50 ampère-hour capacity, and 434 cells of 100 ampère-hour capacity. In May, 1885 (as stated in my paper read before the American Institute of Electrical Engineers), we had 99 batteries of 21 cells each, or a total of 2,079 cells in operation.

I also notice that different methods of connecting storage batteries with dynamos have recently been explained in this paper, and, therefore, I present diagrams of experiments tried in our works; although merely experiments, they were on a working scale.

Our batteries, of the Brush system, are usually charged in series. The experiments were made with two 450-light dynamos and about 300 storage cells—the dynamos are compound wound Brush machines.

1. The two dynamos run in multiple, and all the storage batteries in multiple also.

2. The two dynamos "in series" on three-wire system and the batteries likewise. We do not use either system, but found no trouble in doing so if desired.

Use of the Magnetic Bridge and the Results Obtained.

BY E. WAGEMANN.

In a recent number of THE ELECTRICAL WORLD there is described a method for measuring "magnetic conductivity," invented by Mr. Thos. A. Edison. The writer will describe below a method employed by himself. It is entirely different from that already described, and he does

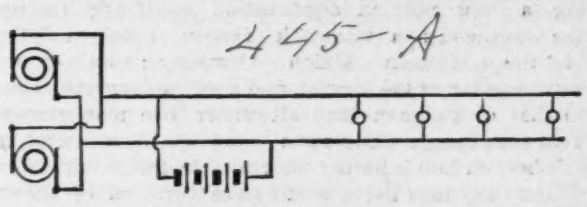


FIG. 1.—CHARGING STORAGE BATTERIES.

not seek to detract from the value of Mr. Edison's very ingenious application of the Wheatstone bridge.

In these experiments the quality of the iron has been te ted as follows: A ring of soft annealed Norway iron is severed into four parts at intervals of exactly 90 degrees, the diameter of the ring being 1 metre. On every quarter ring thus formed there is wound 100 metres of copper wire,

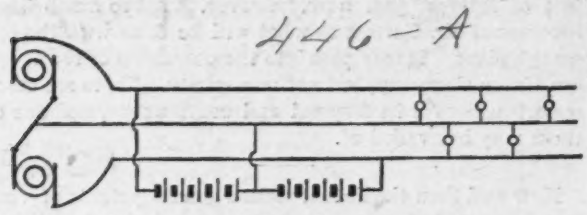


FIG. 2.—CHARGING STORAGE BATTERIES.

1 mm. in diameter, in the same way that shoeshoe magnets are wound.

The terminals of these quarter rings are fastened on a plate of non-magnetic metal such as brass, but so that an uninterrupted circuit through them is maintained, save through quarter ring No. 4, which is so connected that it can be brought in close connection with the piece of iron to be tested, as well as quarter rings Nos. 2 and 3. The piece of iron to be tested is first measured by an ordinary Wheatstone bridge and rheostat for its resistance in the direction of its grain, or, if of cast-iron, in its longest dimension. The value L thus obtained is noted. Then the piece of iron is measured in the direction of its cross section and this value S noted. The term

$$\frac{L}{S}$$

is now calculated, and the iron is weighed in accordance with values of the metric system. The value M thus obtained is multiplied by the value found in the former calculations. This gives, according to my observation, the maximum power of attraction A to be obtained by the iron, if energized under the most favorable condition

Thus the equation stands

$$A = \frac{L}{S} \times M$$

After ascertaining these values, the piece of iron to be inserted is brought in contact with the pole of quarter ring No. 4, making connection with rings 2 and 3. A very sensitive galvanometer being now connected to the extremities of the piece of iron under test (or, if of the shape used in dynamos, to the yokes or poles) the circuit is closed through the coils 1, 2, 3 and 4. This will induce a current in the mass of iron which will deflect the needle of the galvanometer. The deflection is noted and compared with the deflection of the galvanometer produced by the closing of the circuit in the section No. 4. Thus:

$$\frac{2 \tan v_1}{2 \tan v_2} = \frac{I_1}{I_2}.$$

where I is to be multiplied by the value A. The value thus obtained corresponding to G, H, K, N and r of Prof. S. P. Thompson, $S\,I$ being excluded, as it has to be calculated.

I have observed some very curious facts in using this method, regarding the form, shape, etc., of cylindrical and lamellar (compound) magnets, whether bent in the usual horseshoe form or circular.

The best results were obtained with the iron bent in the form of an ellipse, having the major and minor axes in the proportion of 4 to 1. The ellipse seems to be the best form for an electro-magnet.

An Electric Furnace Generator.

To the Editor of The Electrical World:

SIR: In view of the publication in your last number of Mr. Edison's scheme for utilizing the reaction of heat upon magnetism for the generation of electricity, your readers may be interested to learn that the labors of Mr. Edison are in substance anticipated by more than two years, by an application for a patent, filed by Mr. Emile Berliner, the well known electrician.

Believing Mr. Berliner to be entitled to the authorship of the pyromagneto electric generator, and knowing that his work is far in advance of anything hitherto published upon this subject, I, as Mr. Berliner's attorney, asked his permission to publish the text of his application in THE ELECTRICAL WORLD. He readily consented, and I herewith transmit an exact copy of his application, with the request that you may be so kind as to give the same to the public through the medium of your esteemed journal.

You will notice that the numerous suggestions of modifications which appear in the specification contain the germs of valuable improvements upon the original apparatus, and those who know the untiring productiveness of Mr. Berliner will at once understand that these germs were not allowed to die for want of nourishment.

Mr. Berliner freely communicated his original ideas to other electricians at an early period; he invited them to join in his work, but they declined, and, in one remarkable instance, at least, upon the ground that the invention was completed, and that there was no room left for the elaboration of the original idea.

In an historical review of the genesis of an invention, it is proper to notice every step; it is for this reason but just to call attention to the descriptions of pyromagnetic motors described in the *Journal of the Franklin Institute* for January, 1879, p. 39, and in *Science* for March 7, 1884, Vol. III., No. 57, p. 274. While the idea of converting pyromagnetic variations into electricity is foreign to these publications, they evidently emphasize the feasibility of translating the same into motion. Subsequent inventors are indebted to the authors of those motors for the material basis of their inceptions; and Mr. Edison, who is noted for his fairness in matters of this kind, evidently overlooked these *old* facts in his laudable ardor for publishing to the world what he believed to be *new*.

An invention rarely issues fully armed and equipped from the brain of a single inventor, a Pallas Athene is not born every day, and it cannot detract from Mr. Edison's well earned fame if he has to share the credit for the invention of the pyromagneto electric generator with others.

JOSEPH LYONS.

WASHINGTON, D. C.

The following is the specification referred to, copied from the records of the U. S. Patent Office:

ELECTRIC FURNACE GENERATOR.

Filed June 18, 1885.

SPECIFICATION.

To all whom it may concern:

Be it known that I, Emile Berliner, citizen of the United States of America, residing at Washington, in the County of Washington, and District of Columbia, have invented certain new and useful improvements in Electric Furnace Generators, of which the following is a specification, reference being had therein to the accompanying drawing.

The invention has for its purpose the production of electricity by the assistance of heat, and it is based on the following principles:

Iron, when heated to bright red, is not affected by magnetism, and in turn does not react upon that force; but if cooled down to a dull red heat it instantly regains the ability to absorb or engage magnetism. Furthermore, if a magnet is capable of holding suspended a mass of iron, *i. e.*, an iron armature weighing not more than, say 20 pounds, it will also be capable of holding suspended on it a mass of brass, or other non-magnetic material weighing, say 15 pounds, by means of an iron armature weighing only a fraction of an ounce.

This shows that in order to engage, say three-quarters of the attractive capacity of a magnet, a very small portion of the equivalent weight of iron is required to do this. It is also well known that the greater the amount of displacement of the magnetic field in a magneto-electric generator, the greater is the current produced in the conductor of said generator.

If now I take a magnet and provide it with a coil around its pole or poles, and place before this magnet and in proximity to the coil a piece of iron heated to bright red, nothing will occur to disturb the magnetic field, but the instant the iron cools down to a dull red the magnetism becomes excited, and a momentary current of electricity is produced in the coil.

I may go a step further and have a series of such magnet coils and iron armatures, and by connecting the coils into the same circuit and cooling the armatures in rotation, one after the other, a number of electrical impulses will be produced which, when they follow one another rapidly, will approximate a continuous electric current.

These being the underlying principles of my invention, which, of course, is capable of being worked out into different devices for the accomplishment of the same purpose, I will confine myself in this specification to a simple apparatus, capable of demonstrating the underlying principles heretofore stated.

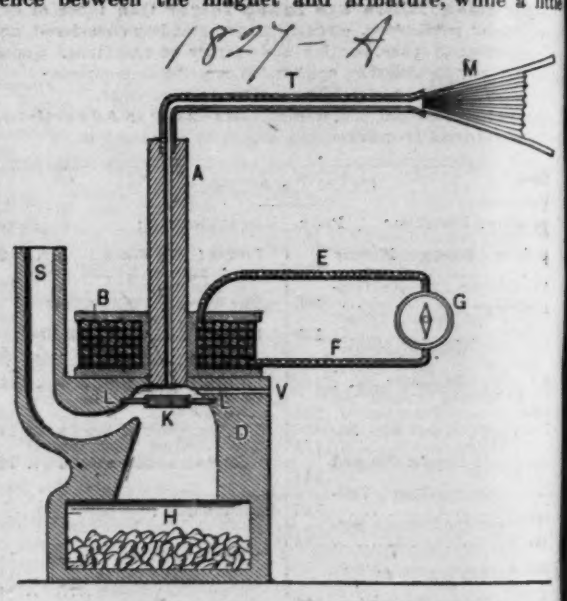
In the drawing A is a magnet, having a tubular hole through its centre. B is a coil of insulated wire, the insulating material being fire-proof, like asbestos, cement or other fire-proof substance. D is a brick furnace provided with a fire-box H and chimney S. K is a plate or disc of iron, set inside a brass ring L, which in turn is so imbedded in the upper part of the furnace that the flames cannot strike above it, but will heat it only from below. The terminals of the coil, which are E and F, are closed through the galvanometer or other electrical apparatus G. A tube T is inserted into the top of the magnet and is provided with and connected to a pair of bellows M.

In order to produce electricity, a fire is started in the box H; the heat on its way to the chimney must then impinge against the iron armature K, which under the continuous influence of the heat, will soon be rendered bright red, when it will have lost its power to engage the magnet A.

If now the bellows be compressed, a current of cooler air will be forced through tubes T and S, against the plate or disc K, and out through the vent holes V. At soon, however, as the air strikes the plate K it will cool it sufficiently to reduce the bright red to a dull red, and instantly the magnetic influence will be re-established, and a corresponding change in the magnetic field will be accompanied by an electric impulse in the coil B. If now the current of cooled air be discontinued or averted, the plate will again resume the bright red, and a current in the opposite direction, but of less intensity, will occur in the coil B.

It is evident that a working up and down of the bellows at a slow enough rate will alternately change the bright red to a dull red and the reverse, and the consequence will be a series of electrical impulses in the coil B, which may then operate the electrical apparatus G.

It will be observed, since the depression of the bellows requires comparatively little force, that the principal acting force is the heat, which suspends the magnetic influence between the magnet and armature, while a little



BERLINER'S ELECTRIC FURNACE GENERATOR.

draft of compressed cooler air re-establishes this influence suddenly. The current thereby produced might be utilized to charge another coil surrounding the magnet and re-enforce the magnetic field; and in that case the magnet might be substituted by a tubular core of iron; the bellows might be dispensed with, and a constant source of compressed air might be employed, regulated by suitable mechanism to supply the air puffs to be directed against armature K, or even pieces of cold metal might be made to approach the armature at intervals, and cool it by contact with the same; or by absorption and radiation; or a series of coils and magnets might be placed toward one larger armature disc forming a common armature, heated by one furnace.

All these ideas can be brought to bear on the subject whenever time offers itself to experiment, which is the most effective modus. For the present, I claim:

The combination with the magnetic field and a conductor situated therein, of a piece of iron which is alternately heated and cooled, thereby producing electricity, substantially as described.

In testimony whereof, I have affixed my signature in the presence of two witnesses. EMILE BERLINER.

CHARLES W. HANDY, MYER COHEN. } Witnesses.

Railway Bridge Protection.

To the Editor of The Electrical World:

SIR: I note in your issue of Aug. 27th an inquiry from "J. D. W." of Amherst, Mass., regarding devices to protect approaching railroad trains in case a bridge of any kind has been burned or in any way disabled, to prevent the train passing safely over. I have a device which is as follows: A danger signal placed each side of bridge, say one-half mile distant. This is held in place by an electro-magnet and suitable armature on a closed circuit of gravity batteries. A line is run from batteries through both signals and across the bridge. Sections are put in the wire of soft solder that will melt off in case of fire, or break in case the bridge falls or is carried away. So that if the bridge burns or is washed away or the batteries become weak, the signals are seen to go to "Danger."

BOSTON, Mass. H. W. CUTLER.

Transfer of the Baltimore & Ohio Property.

The transfer of the huge Baltimore & Ohio property has long been talked of and has come at last. The following official announcement was made on Sept. 2 by Drexel, Morgan & Co.:

"A preliminary contract has been executed to-day between the Baltimore & Ohio Railroad Company and J. S. Morgan & Co., Baring Brothers & Co., and Brown, Shipley & Co., of London, and their allied houses on this side.

Returned 9/13/87

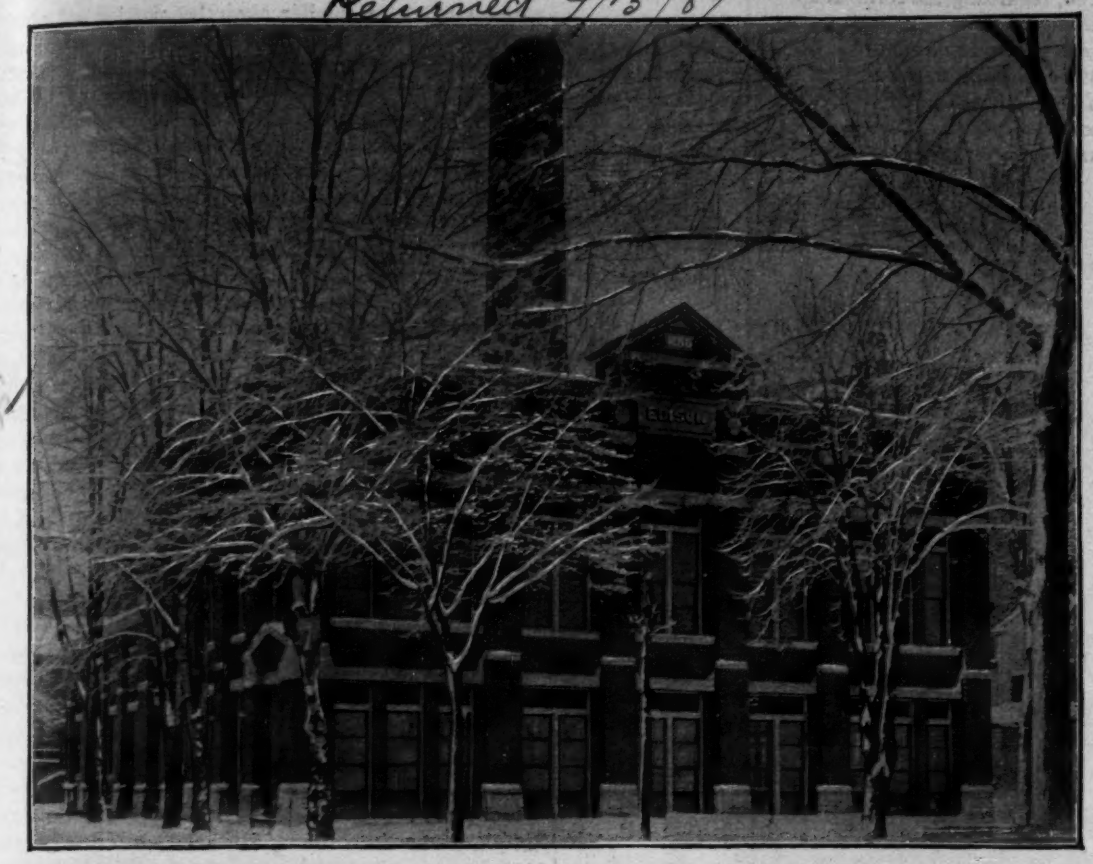


FIG. 1.—THE EDISON STATION AT DETROIT, MICH. WINTER SCENE.

This contract provides for the negotiation of $5,000,000 Baltimore & Ohio consolidated 5 per cent. bonds and $5,000,000 Baltimore & Ohio preferred stock for the purpose of paying off the entire floating debts of the company and placing it upon a sound financial basis. The conditions are as follows:

"First. The verification of statements, etc., as made.

"Second. That the management of the company shall be placed in competent hands satisfactory to the syndicate.

"Third. That satisfactory contracts shall be made between the Baltimore & Ohio and the other roads for New York business, which shall remove all antagonism between them on the subject and insure the permanent working of the Baltimore & Ohio in entire harmony with the other trunk lines, and also avoid construction or threat of construction of extensive parallel lines north and east of Philadelphia.

"The houses interested on this side are Drexel, Morgan & Co., Drexel & Co., Brown Brothers & Co., and Kidder, Peabody & Co."

As is already known, the United States Express Company has purchased the Baltimore & Ohio express system. It is said that the Pullman Company will now obtain the palace car service, and, finally, that Mr. Jay Gould will get his share in the telegraph system. In fact, it is alleged that $500,000 has already been paid on account for the telegraph system, to the syndicate, the whole sum asked being $6,000,000.

Lower Cable Rates.

The following circular letter, not wholly unexpected, was issued on Sept. 1 from the executive offices, at No. 40 Wall street, of the Commercial Cable Company (Mackay-Bennett cables):

To the Patrons of the Commercial Cable Company:

On and after Sept. 15, 1887, our tariff will be twelve cents per word to Great Britain, Ireland and France, and fifteen cents per word to Germany.

We have, in justice to our patrons, decided upon this reduction in order to give them the benefit of the lowest rates during the time the tariff war may last. We sincerely thank our friends for the hearty support they have so steadily given us, and believe the cabling public will see it to be to their interest to favor the Commercial Company with a continuance of their patronage.

GEORGE G. WARD,
Secretary and General Manager.

Vice-President Hector De Castro, of the Commercial Cable Company, said that the reduction had been made from twenty-five cents a word not because of lack of business, for the patrons of the company had stood by it nobly, but simply because it was the fair thing to do.

"The war," he said, "has lasted longer than anybody expected when it began. We have received all the business of a great many houses at double the rate of our rivals, because—first, our company was regarded as a protection against exorbitant charges, and second, it gave a quicker and more accurate service. But we think it is now time to give our customers as low a rate as any other company gives."

"Do you look for much increase in your business at the lower rate?"

"Certainly. A great many firms have informed us that at the lowest current tariff we would get all their messages, and had they been able to afford it they would have given us their business at the 25 cent rate. There is no doubt whatever that we will have all the work we can do with an increased force of operators. The expenses will be heavier, but the net result will be satisfactory."

"Why was not the reduction made to go into effect immediately?"

"Two weeks' notice of the reduction in rates from the European offices must be given to the International Bureau of Telegraphic Administration at Berne. This notice was sent from our Paris office yesterday."

With regard to a recent increase in the capital stock, Mr. De Castro explained why $2,000,000 additional stock had been issued and taken by the stockholders. He said that the cables and other parts of the company's plant had cost $9,000,000, while only $4,000,000 of stock and $3,000,000 of bonds were issued, leaving a floating debt of $2,000,000. The new cable from Waterville, Ireland, to Bristol, England, cost a large sum, and other extensive improvements had been made. The stockholders had the option to take stock or bonds to the amount of the floating debt, and they finally decided to take stock. Therefore the stock was issued.

Telegraphers' Mutual Benefit Association.

The following proposed amendments to the by-laws have been filed in the secretary's office for submission to the annual meeting on Nov. 16:

It is proposed to amend Section XXVII. of the By-Laws by substituting the words *five hundred* for the words *one thousand*, wherever the latter occur in said section. (Signed) Chas. P. Bruch and 24 others.

It is proposed to amend Section XIII. of the By-Laws by substituting for the word *two* the word *four*, so that it shall read, "an amount equal to four per cent. (4 per cent.) of the entire amount of insurance," etc. (Signed) A. R. Brewer and 25 others.

It is proposed to amend Section XIII. of the By-Laws by substituting for the word *two* the word *three*, so that it shall read, "an amount equal to three per cent. of the entire amount of insurance," etc. (Signed) A. R. Brewer and 24 others.

The Detroit, Mich., Edison Station.

No small part of the development of electric lighting is now concerned in the construction and arrangement of central stations. The modern electrical engineering differs from the old in that it deals with enormous currents and represents the utmost refinement and perfection of detail, not only in its own distinctive field but in every branch of mechanical engineering. Questions have to be considered as to the best apparatus for turning steam into current; the most economical forms of engines and boilers; the most convenient disposition of generators; the best system of taking conductors out of the station; the closest approximation to a well balanced district, with the station as a true electrical centre; the greatest facilities for discharging the regular daily duties with the minimum force of employés, and a variety of other details the mere enumeration of which would fill this page. How all the varying conditions of central station construction and work are met constitutes to-day a most important problem in the supply of the electric light as a commercial article. The failure of a large station may turn on mistaken ideas or wrong calculations as to the main features, and not seldom the success can be looked for in the skillful adjustment of complex details to their environment and needs.

The Edison Electric Light Company has wisely made a specialty of the work of central station construction, and can point to several places where the ability displayed in this sphere is of a high order. One of these stations, that at Detroit, we illustrate herewith. At the close of last year the station named was put in operation, and it has since been at work continuously, without interruption. Following the practice established by a large number of previous installations this plant was laid out carefully beforehand, with the object of allowing for the usual increase in service, which is already called for.

Returned 9/13/87

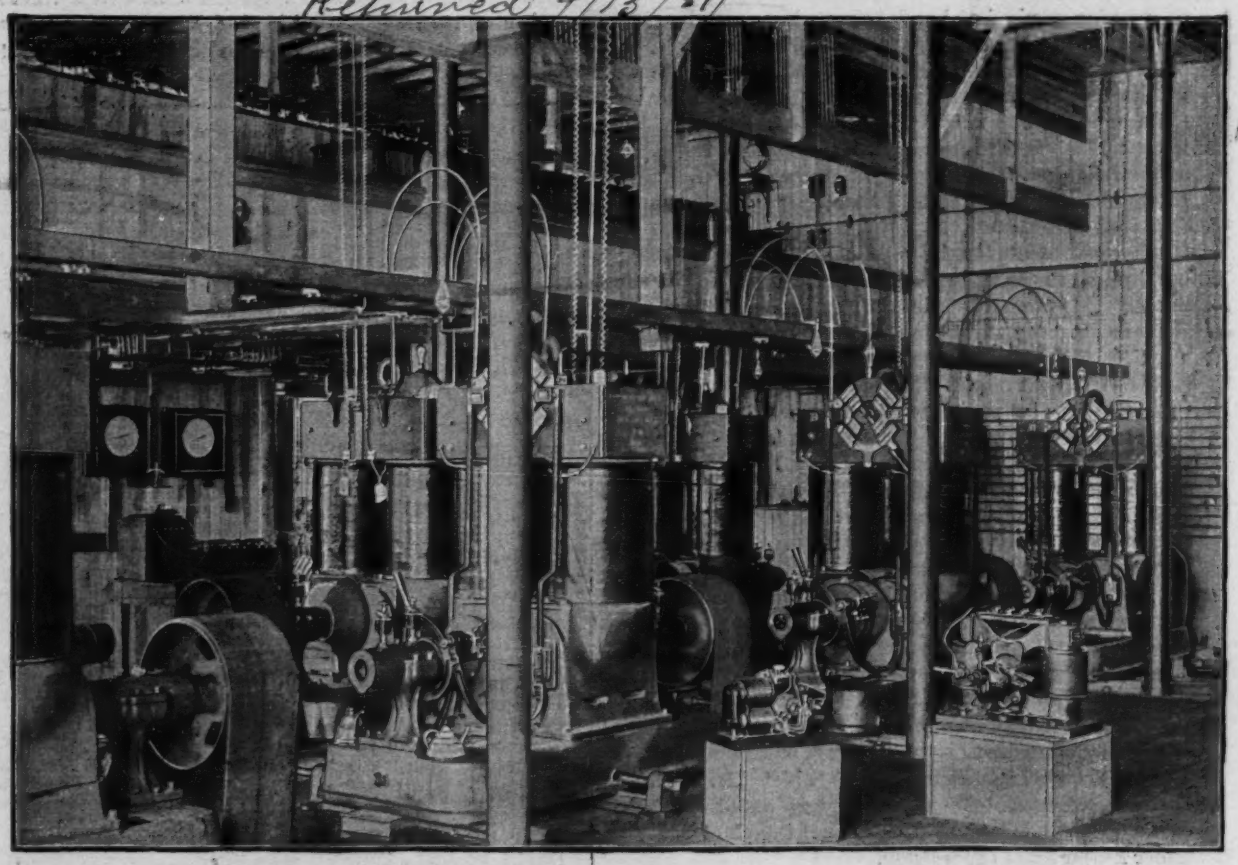


FIG. 2.—DYNAMO ROOM, DETROIT EDISON STATION.

The building, of which an exterior view is given in the engraving, Fig. 1, covers a plot 70 × 100 feet in area, and is two stories high. It is built of pressed brick, with sandstone facings, and presents a neat appearance in its wintry garb of snow and icicles. It will be noticed that not a single pole is to be seen, as the entire system is under ground, as usual in large Edison urban plants. The station stands almost at the exact electrical centre of its area

of supply, and its location was very carefully selected. The ground floor of the building contains the engine and boiler room. The latter, which measures 65 feet × 44 feet 6 inches, contains at present four 300 h. p. safety water tube boilers, Fig. 3, and has room for two additional 300 h. p. boilers. The present boilers are set with the Murphy

Returned 4/13/87

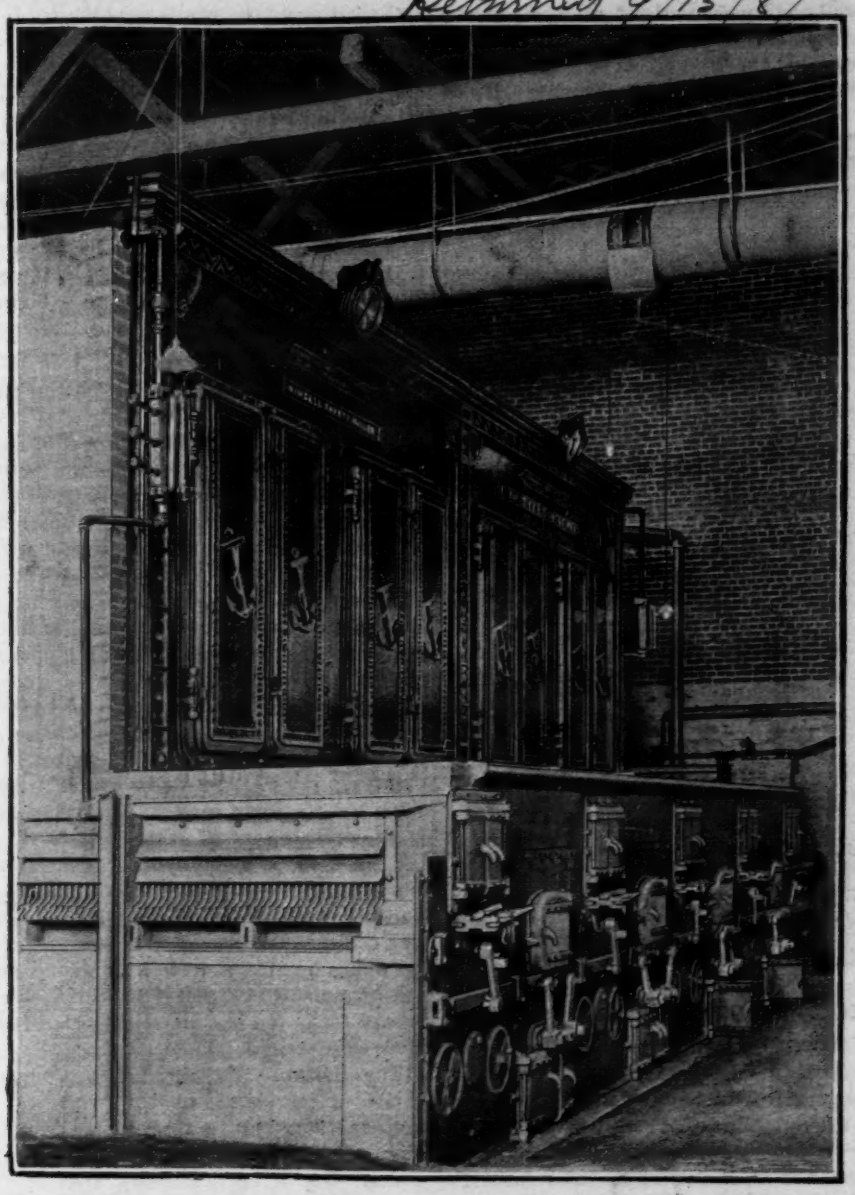


FIG. 3.—BOILER ROOM, DETROIT EDISON STATION.

automatic stoker, which gives the highest economy in consumption of fuel, and requires less firemen than by the regular method of hand firing. Here are also placed two National feed water heaters of 800 h. p. each.

The engine-room, which is 65 × 50 feet, is shown in part in Fig. 4. It contains at present eight Armington & Sims engines, 15½ × 15. Each engine has two band wheels which belt to dynamos placed on the floor above, as shown in Fig. 2. There are at present sixteen dynamos of 500 16 c. p. lamps installed, and by the arrangement described great economy of space is effected, so that ample room is left for the additional machines which will be required in the future. The plant is running to its full capacity. Among the principal customers of the Detroit Edison Company will be found the most prominent hotels, the U. S. Post-Office, principal opera-houses and theatres, and the largest mercantile establishments in the city. There are now connected to the main conductors of this company all classes of lighting, closely approximating ten thousand lamps. The current for lighting purposes is all sold on the Edison meter system, the meters being found accurate and reliable; and in all large Edison station systems it has been decided that the sale of incandescent light by contract is impracticable, because of the variable demands of the consumers. Both the consumer and the company are better satisfied on the meter system. The day service includes a number of motors (about 200 h. p.). One drives machinery employing 250 people. Another operates the presses of the Detroit *Daily Tribune*.

The entire arrangements of the station were designed and carried out by the engineering department of the Edison Electric Light Company, of which Mr. J. H. Vail is General Superintendent, and every detail looking to economy in operation and durability of the plant has been under his personal supervision.

The Melting Platinum Standard of Light.

M. Violle, in a statement which he has recently submitted to the Académie des Sciences, deals with the comparative radiations from melting platinum and melting silver. One of the metals was introduced into the little decimal lamp of Dr. Siemens, which consists essentially of a box pierced with a hole one-tenth of a square centimetre in area. Immediately behind this hole is the metal in the form of a thin ribbon traversed by a strong current of electricity, which is raised in intensity until the point of fusion of the metal is reached, when its radiant power can be observed. In this way M. Violle found that the total radiation from melting platinum is 54 times that of melting silver. This ratio of total radiant energies, while very considerably on the side of the platinum, is yet much lower than the ratio when luminous radiations only are compared, in which case it is as much as 1,000 to 1. In the course of his observations, M. Violle admits that Mr. Methven is correct in stating that in all flames there is a region of constant radiant intensity. For his own experiments upon the comparative luminosity of the radiations from molten silver and molten platinum, M. Violle employed, as an intermediary, the Hefner-Alteneck amyl-acetate lamp, and which, according to his determination, is related to the other photometrical standards by the ratio as follows: 1 Siemens = 1.95 Hefner = 0.882 Methven = 0.208 Carcel = 0.1 Violle. Thus the radiation of light from a square centimetre of molten silver is less than 0.02 Hefner-Alteneck. Mr. Dibdin, in his report on photometry to the Metropolitan Board of Works, gives the following description of his method of working with the platinum standard: "Unfortunately I have been unable to try the precise plan suggested by M. Violle for obtaining a standard from platinum at its melting temperature; but in lieu of this I have tried a device which gives promise of practical results. The method adopted was to heat to its melting point, by means of an oxy-hydrogen flame, a piece of platinum foil placed behind a steatite screen perforated with an aperture smaller than the portion of platinum actually incandescent. This arrangement, while simple in operation, has afforded very promising indications, and seems well worthy of further experimental observation, as there can be little doubt but that an easily worked and reliable system for obtaining a steady light from molten platinum would find ready acceptance as being definite for all time. When working by this method, the oxy-hydrogen flame is gradually increased in intensity until the platinum foil melts. When this happens the oxygen is turned off, and a fresh portion of foil, which is carried on two rollers, one on each side of the aperture, is brought into position, and a second experiment made; and thus successive readings obtained, if necessary, in rapid succession. The foil is wider than the portion actually perforated by the intense heat, so that by turning a winch-handle, a fresh surface is almost instantly obtained. The operations involved in testing are thus about a quarter of a turn of the winch-handle, and turning the oxygen on and off at the beginning and end of each test respectively. The aperture in the steatite screen is about one-fifth of an inch in diameter, and allows light equal to a little more than two candles to pass to the photometer disc. While the proposition to obtain a standard light by this means is theoretically satisfactory, and the preliminary practical results have been very promising, the details are as yet insufficiently worked out to compete against more established systems."

Returned 9/13/87

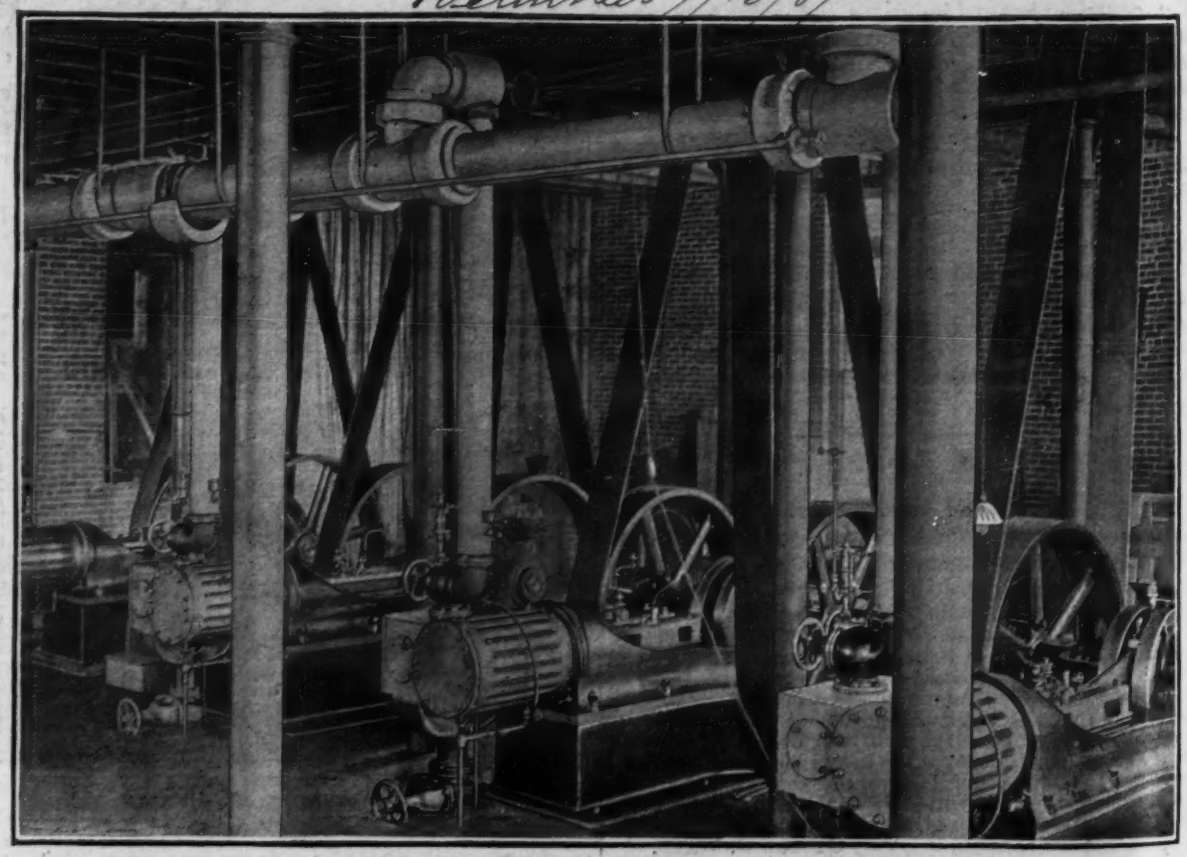


FIG. 4.—ENGINE ROOM, DEROIT EDISON STATION.

Electric Lighting in a Sea Fog.

It appears that the U. S. S. "Atlanta" had an interesting experience in a fog at Nantucket the other day, and, according to a statement made by Lieut. Bradley A. Fiske in a letter to a friend, it found an extremely useful employment for the electric light on ship board. The vessel being caught in a fog at night near the shoals of Nantucket, it became advisable to anchor, and the depth of water not being all that could be wished, it became even more advisable to find deeper water. The steam launch was therefore lowered and sent out to sound around the ship. But the fog and darkness were so dense that the launch could not get 50 feet away without losing sight of the ship. In this emergency, one of the officers made the happy suggestion that the electric search light be used to *illuminate the fog*. The plan worked admirably. The light was turned so as to throw its powerful beam in the direction of the launch and over her. She was thus given a point of reference which, it was found, she could keep up to a distance of a quarter of a mile. With this aid she was able, after some hours of sounding, to find deeper water. Then the "Atlanta" hove up anchor, followed the launch through the fog and night, guided by her whistle, and soon was safe with many fathoms under her.

The New Waterhouse Dynamo.

We illustrate on this page the improved No. 8 Waterhouse dynamo, made by the Waterhouse Electric and Manufacturing Company, of Hartford, Conn. In its present form the dynamo rests on an iron pan which collects any oil that would otherwise saturate the floor, and on the side of the pan are two adjusting screws that connect to nuts in a T groove for the purpose of shifting the dynamo to tighten the belt. The stands are strong and substantial, having a recess within them for collecting the oil from the journals: and the oil can be drawn off by the pet cocks shown on the stands. The journals have long bearings. On the commutator are the three brushes, which do not have to be moved when regulating the current.

The Waterhouse dynamos are well adapted, owing to the reliability of the regulator, for all electrical purposes where a constant current is desired, such as the running of arc lights and motors, charging storage batteries, etc. With part of a load on the machine the power is proportionately reduced and the whole part of the load can be thrown on or off at will, the regulator compensating for the changes, so that the current will always remain at standard.

The smooth running of the Waterhouse dynamos is very noticeable.

Early Suggestions as to Electric Welding.

We are in receipt of the following, to which our attention is called as an anticipation—so far as it goes—of recent work in electric welding. It is taken from a note on the Fusion of Metals by Voltaic Electricity. by J. P. Joule, F. R. S., etc. Manchester Memoirs, Vol. XIV., p. 49:

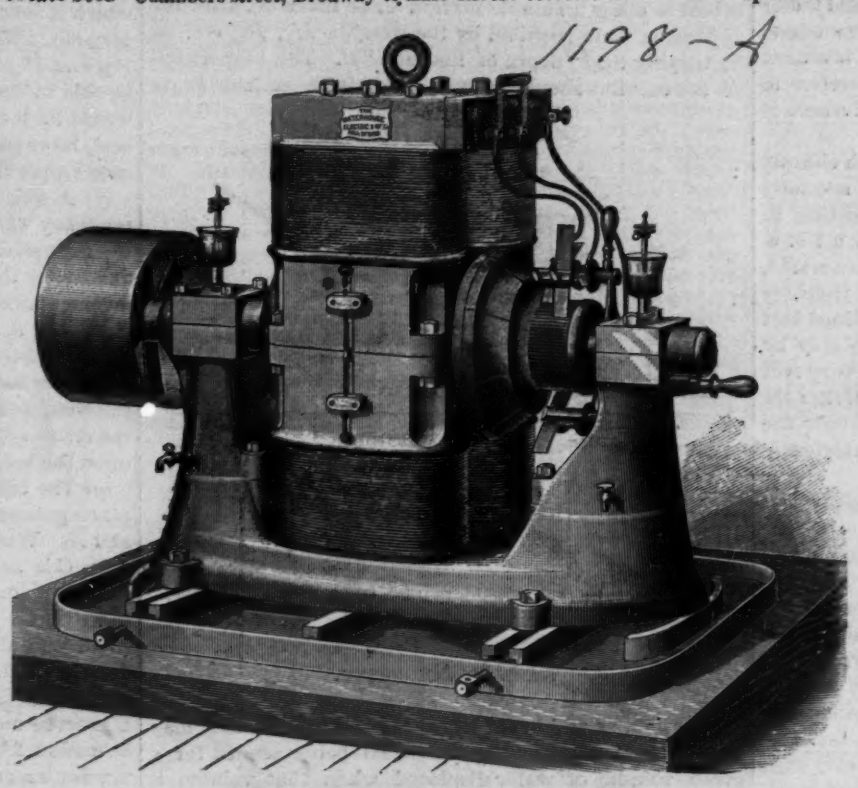
"The attention of practical scientific men has of late been much occupied with the question how far it is possible to forge large masses of iron without destroying the tenacity and other valuable qualities of the metal employed. In welding iron the metal is raised to the high temperature at which it assumes a soft and incipient viscid consistency. Two pieces of iron in this condition will adhere together slightly if merely placed in contact with one another. That a firm junction cannot be made in this way is simply owing to the fact that few particles are brought into contact and that the metallic continuity is only established at those points. The hammer is therefore employed to cause the entire surfaces to meet together. The same end has also been attained by the employment of great pressure, and probably we shall ultimately see large masses of forged iron formed by simply subjecting a bundle of smaller wires raised to the welding temperature to the operation of great pressure. To succeed in the later process it would, however, be requisite to press clean unoxidized surfaces together. Indeed, the importance of presenting clean surfaces together in ordinary welding cannot be too strongly insisted on, for if oxide of iron be present a portion of it will not fail to remain at or in the neighborhood of the juncture and seriously impair the qualities of the iron at those points. It occurred to me some months ago that it might be possible to employ the calorific agency of the electric current in the working of metals. By the use of a voltaic battery there appeared to be no doubt but that small pieces of metal could be fused into one lump. If so, it was obvious that by employing a battery of adequate size the largest masses of wrought iron could be produced, the question resolving itself simply into one of cost. It was not before the last month that I had an opportunity of witnessing an experiment on a small scale. It was performed at the laboratory of Prof. Thomson. He surrounded a bundle of iron wires with charcoal, and after transmitting a powerful current through it for some time the wires were found in one part to be completely fused together. More recently I have made several experiments, in which the wires were placed in glass tubes surrounded with charcoal, etc. With a battery of six Daniell's cells I have thus succeeded in fusing several steel wires into one, uniting steel wires with brass, platina with iron, etc. I doubt not but that in many instances the process would advantageously supersede that of soldering, especially when, for thermo-electric or other purposes, it is desirable to join metals of difficult fusibility without the intervention of another metal which melts at a lower temperature. Having demonstrated the possibility of obtaining perfect junctions by means of the voltaic current, let us inquire what expenditure of battery materials would be necessarily involved. In the outset it may be remarked that were not heat continually removed by conduction, convection and radiation from a wire carrying a current, of however low a degree of intensity, the wire would ultimately attain an excessively high temperature on account of the continuous augmentation of heat within it. Now the escape of heat may be largely prevented by means of non-conducting substances, and will be nearly proportional to the surfaces, so that by employing sufficiently large masses of metal and surrounding them with non-conducting materials it may be reduced to almost any extent. The quantity of zinc required to fuse a large mass of iron may therefore be estimated as follows:" (Here follow figures on the subject). The article ends thus: "The quantity of zinc consumed in the voltaic process is therefore nearly equal to that of the iron to be melted, but it would be possible to effect the same object in a more economical manner by availing ourselves of the use of the magneto-electrical machine. This machine enables us to obtain heat from ordinary mechanical force, which mechanical force may again be derived from the conversion of heat, as in the steam engine. In a steam engine it is practically possible to convert at least one-fifth of the heat due to the combustion of coal into force, and one-half of this force applied to work a magneto-electrical machine may be evolved in the shape of heat. Hence, then, it is possible to arrange machinery so as to produce currents of electricity which shall evolve one-tenth of the quantity of heat due to the combustion of the coal employed. So that 5,000 grains of coal used in this way would suffice for the fusion of one pound of iron."

Public Lighting in New York City.

The New York City Gas Commission met in the Mayor's office on Sept. 1, and awarded the following contracts for lighting the streets and avenues of the city of New York with electric light.

To the United States Illuminating Company:

	Lights.	Cents each.
Washington Park	15	24
Cortland street, Broadway to West	5	40
Liberty street, Broadway to West	5	40
Barclay street, Broadway to West	8	40
Whitehall, street, Bowling Green to South Ferry	5	40
Chambers street, Brodway to East River	15	40



NEW WATERHOUSE DYNAMO.

To the Brush Electric Company:

Avenue A, Fourteenth to Twenty-fourth street	9	25
First avenue, Fourteenth to Fifty-ninth street	53	22
Grand street, Broadway to Sullivan	7	25
Irving Place, Fourteenth to Twentieth street	6	40
Avenue A, Fourteenth to Twenty-second street	8	25
Union and Madison Park	22	25
Fourth avenue, Fourteenth to Seventeeth street	3	40
Eighth street, Third avenue to East River	14	40

To the East River Electric Company:

Park Row, Ann street to Bowery	14	19 9/10
Bowery, Park Row to Third avenue	20	19 9/10
Third avenue, Bowery to Fifty-ninth street	60	19 9/10
Grand street, Broadway to East River	3	19 9/10
Sixth avenue, Carmine to Fifty-ninth street	51	19 9/10
Eighth avenue, Fourteenth to Fifty-ninth street	46	19 9/10
Broadway, Canal to Fourteenth street	33	19 9/10
Tenth avenue, Fourteenth to Fifty-ninth street	41	39
Centre street, Brooklyn Bridge to Grand street	13	39
Desbrosses street, West to Canal street	5	39
Christopher street, Sixth avenue to West street	11	39
Houston street, river to river	39	39
Tenth street, Second avenue to East River	7	39
Eighth street, Sixth avenue to Cooper Union	8	39
Fourth avenue, Broadway to Fourteenth street	7	39
Third avenue, Fifty-ninth to Eighty-sixth street	27	19 9/10
Avenue B, Houston to Fourteenth street	12	39
Avenue D, Houston to Fourteenth street	11	39
First avenue, Houston to Fourteenth street	12	39
West Broadway and South Fifth avenue, Chambers street to Washington square	22	39
Stuyvesant street, Eighth street to Tenth street	3	39

To the Mount Morris Electric Company:

Greenwich street, Battery place to Warren street	15	40

To the Harlem Electric Company:

125th street, Sixth avenue to Manhattan street and to North River	28	24
125th street, Sixth avenue to East River	10	24
Eighth avenue, 121st to 155th street	34	24
Third avenue, Eighty-sixth to 130th street	44	24
Mount Morris Park	12	50
Harlem Bridge, Third avenue	7	60

To the American Electric Manufacturing Company:

Sixth avenue, 110th to 136th street	25	32
110th street, Boulevard	16	32
Boulevard, 110th to 155th street	52	32

To the North New York Electric Light Company:

	Lights.	Cents each.
Third avenue, Bridge to Willis avenue	20	40
138th street, Third avenue to Madison Avenue Bridge	6	40

The Bad Odor of Arc Lights.

Complaint was recently made by the correspondent of a Rochester, N. Y., paper as to the bad odor of the electric lights on the streets. Mr. Redman, the manager of the Brush Company, endeavored to correct certain curious misconceptions on the subject, and said:

"The bad odor at this time of the year does not come from the electric fluid nor from the burning of the carbons. The explanation is very simple, and would be manifest to this correspondent if he had ever been present at the cleaning of a lamp after a warm night. The light attracts innumerable insects that kill themselves in contact with the lamp and collect there by the pintful. The mass of decaying animal matter gives out the offensive odor that the correspondent complained of. I do not wonder at his complaint, for the stench is particularly offensive. In certain situations we are obliged to protect the lamps with wire gauze to prevent the winged creatures from flying against them and interfering with the light. Ever since the introduction of electric lights here the workmen at the various works have been wondering at the strange and varied visitants that come into the rooms at night. Our works at the lower falls are particularly well situated to attract all sorts of creatures that fly by night, and we have a very miscellaneous collection pinned on the walls after the fashion of regular entomologists. The boys have had some monster moths come in at night and all the specimens were duly pinned to the wall. It might interest a collector to call and examine our cabinet. Most of those we have seem to fly altogether by night, for they are of a kind that I never see by day. In former years we frequently caught a large green butterfly, but I have not seen one of them this year. Perhaps their season for skirmishing by night does not arrive until later in the year. By the way, the men at the works occasionally assume the functions of experimental philosophers, and try electrical experiments on various living creatures, including man. Cats, dogs and snakes are favorite subjects for experiments, and the dog or cat that has once ventured into an electric light works without a friend to protect him from experimentalists is likely to go away with such a lively recollection of his experience that he will never call again. Dogs or cats that are given a shock seem to regard it as something unnatural and diabolical—that is, if they have any idea of such things. They exhibit symptoms of fear that are not manifested when they are hurt by ordinary means. We caught some snakes in the rocks near the works and found that a slight shock was enough to kill them. Great and small ones never made a movement after receiving a current." The attractiveness of the arc lamp to insects and birds is now being taken advantage of by naturalists anxious to secure specimens. The same device has also commended itself to sportsmen, who thus obtain big bags.

Safety Signals for Bridges.

To the Editor of The Electrical World:

SIR: We notice in your issue of Aug. 27 an inquiry from "J. D. W." asking if it would not be practicable to place upon every wooden bridge an appliance which should give warning of a fire at such bridge, and thus prevent such an accident as has just occurred at Chatsworth, Ill.

In reply we will say that in connection with our electric signals and semaphores we can place upon wooden bridges a simple appliance that will indicate fire, and by placing our signals at a safe distance from either end of a bridge, say half a mile or more; if necessary, we can at once give notice to approaching trains from either direction, that the bridge is unsafe. Our signals are held to a safety position by a current of electricity, and when a fire or other cause breaks this current the signals at once assume a danger position by gravity.

We can also show any unsafety in iron bridges.

GOULD-TISDALE RAILWAY SIGNAL COMPANY.

BOSTON, Mass.

Mendota, Ill.—The Mendota Electric Light Company operating the Thomson-Houston system of arc lights for the past three years, has experienced a demand for more light and has lately increased its capital stock to $12,000. It will enlarge its station preparatory to putting in a Westinghouse 200-light direct current machine, driven by Schieren & Co.'s belting from an Ide engine and steel tubular boiler set with Jarvis furnace. The company intends to install this increase of plant itself, and will purchase all supplies and apparatus in the open market. Its affairs are in the hands of progressive men and the outlook is excellent.

A New Dynamometer.

BY PROF. J. BURKITT WEBB, STEVENS INSTITUTE, HOBOKEN, N. J.

Since the date of the suggestion, by Prof. Brackett, of the idea of suspending a dynamo upon a pair of knife edges, as a means of measuring power consumed in driving the machine, all power tests of dynamos and motors made at the Stevens Institute have been made by the application of a "Brackett Cradle" dynamometer; and machines ranging from ½ horse-power motors weighing 10 lbs. to 3-ton dynamo machines, absorbing 60 horse-power, have been successfully measured in the Experimental Department. The result of such experience has been to establish the belief that where the power of a single dynamo is concerned and a vertical driving belt can be used, any improvement upon a Brackett cradle is impossible, as the heaviest dynamo can be adjusted in a few hours so that twentieths of a horse-power can be measured with absolute certainty, while the fact that but a single set of knife edges is involved makes the instrument as fully entitled to be considered a standard of reference for all other dynamometers as is a steelyard for the standardization of spring balances or more complicated forms of weighing apparatus.

When, however, it is desired to couple the shaft of a dynamo directly to another shaft, as is the case in testing an electric motor (whose power is best absorbed by a dynamo coupled to the motor and delivering its current into an adjustable rheostat), a cradle must be sufficiently long between knife edges to admit the two dynamos placed side by side within the uprights. This requires the cradle to be a very heavy structure and correspondingly expensive; it is difficult also to put the shafts of the dynamo and motor exactly in line with each other and with the knife edges, and with high speeds and consequent jar it is almost impossible to keep them so. Any attempt therefore to rigidly couple the two shafts sacrifices the sensitiveness of the dynamometer's indications.

Motor tests at the Institute have been made with cheaply constructed light cradles, but only by the use of specially designed adjustable couplings. It was while assisting in overcoming the difficulties which arose in testing a 1 h. p. motor run at 2,500 revolutions per minute on such a cradle, that the idea of the new dynamometer suggested itself.

Again, if it is desired to use a horizontal or inclined belt to drive a dynamo on a cradle, it can be done only by making a very expensive form of knife edge and very stiff uprights, and introducing features which *embarrass the free action of the knife edges*, in a manner that only the most accurate workmanship can prevent from interfering with the sensitiveness of the cradle.

I refer to the device of using projections at each end of the knife edges, in the form of a cylindrical axle, which, having their axes coincident with the line of contact of the knife edges, may be confined in a bearing so as to receive the strain of a horizontal belt. Prof. Denton has improved upon this arrangement by allowing the cylindrical projection to roll upon the cylindrical surface of a sector of a circle whose apex acts as a knife edge oscillating about an abutting point attached to the foundation. The extra friction due to resisting the horizontal belt tension is thus reduced entirely to rolling and knife edge friction, but both these devices require the nicest workmanship to avoid interfering with the freedom of the knife edges upon which the dynamo is suspended.

To avoid these objections the writer devised the arrangement herein described, involving the application of a mechanical principle believed to be novel to dynamometry.

The arrangement has been successfully applied thus far to a pair of ½ horse-power sewing machine electric motors coupled rigidly together, but an apparatus designed to receive a dynamo of a ton in weight is under construction. The following is a description of one form of "floating dynamometer:"

A dynamo or other machine whose power is to be measured is mounted upon a platform K, resting upon four boxes or "caissons" J_1 J_2 J_3 J_4, floating in the tanks I_1 I_2 I_3 I_4, placed at the four corners of a rectangle whose length A_1 A_3 is slightly greater than its breadth A_1 A_2. The tanks J_1 J_2 and caissons I_1 I_2 only are seen in the cut, the others being of course behind them. The tanks being connected by a hose G, the water will be at the same level in all of them, and they will therefore be equivalent to one large tank, with the advantages, however, of greater portability, of requiring the minimum amount of water and of being free from the disturbing action of waves.

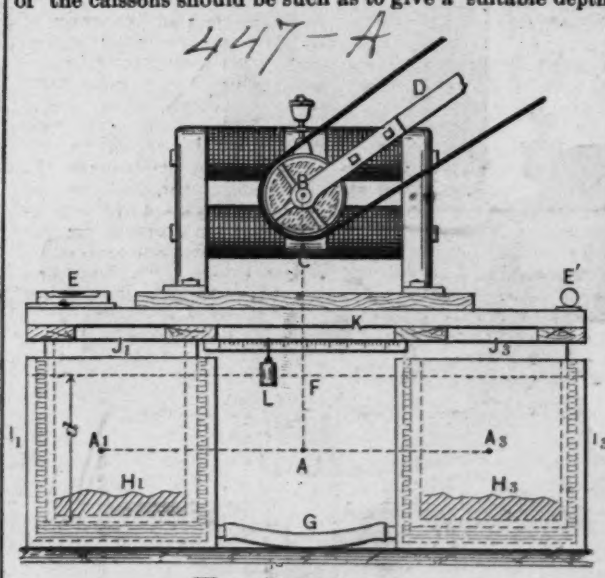
We shall call the platform with the dynamo caissons and parts connected therewith the "float," and its action will be exactly the same as that of any other floating body. If the caissons are too near together, the float will be top-heavy, or, in technical language, it will be in "unstable equilibrium" when placed in the upright position, and will tend to depart from that position and lean over against the sides of the tanks; it may not tip over suddenly, unless the tanks are quite near together, because as it tips water must flow through G to keep the surfaces on a level. If the caissons are too far apart the float will tend to "right" itself, like a properly built ship, and will settle to a position of "stable equilibrium." We have therefore the means, by a proper adjustment of the position of the caissons, of putting the float in the condition of "neutral equilibrium," so that it will have neither a tendency to tip nor to right itself, but will stay in any position, upright or inclined, into which it may be tipped.

For the purposes of the dynamometer the caissons should be so adjusted as to give a slight degree of stable equilibrium, *i. e.*, the float should have a slight tendency to right itself, which may need to be a little greater in one direction than in the other, in which case the rectangle A_1 A_2 A_3 A_4 will depart slightly from a square. To distinguish between the two directions of tipping, we shall hereafter suppose "tipping" to mean tipping about an axis parallel to the dynamo axis; and to distinguish a tipping at right angles thereto, we shall say "tipping sideways"; the same distinction will apply also to the word "level," and to "right itself," etc.

Instead of a final accurate adjustment of the position of the caissons to obtain the desired sensitiveness to tipping, the centre of gravity C of the float may be lowered by placing weights H_1, H_2, etc., in the caissons; or it may be raised by transferring some of this weight up on to the platform. Raising the centre of gravity tends, of course, toward top-heaviness, and therefore increases the sensitiveness. It must be borne in mind, however, that this method of adjustment alters the sensitiveness sideways at the same time, which may sometimes be desirable and sometimes objectionable.

Very simple calculations suffice for the construction and operation of this dynamometer:

(*a*). In order that the weight of the dynamo may be supported together with that of the platform, caissons, etc., it is necessary to make the caissons of such size that they will displace a weight of water equal to that of the entire float; this weight need not be known exactly, as it is best to allow an ample margin to be made up, after the apparatus is in position, by the weights H_1, H_2, etc., or by varying the "depth of flotation" d. The proportions of the caissons should be such as to give a suitable depth



WEBB DYNAMOMETER.

of flotation, as will be explained later, otherwise they may be of any form, the least material being needed for a given volume of water displaced when that volume is nearly cubical. With four equal caissons the volume of each, would, of course, be one-fourth of the total volume. Having determined the dimensions of the caissons the tanks should be large enough to allow for two or three inches thickness of water around and beneath the former.

(*b*). A rough value for the sides of the rectangle A_1 A_2 A_3 A_4 or distances between the centres of the caissons can be obtained as follows: Let $2a$ = side of the square to which the rectangle reduces when the float is in neutral equilibrium; A_1 $A_2 = A_3$ A_4 will be equal to $2a$, or slightly greater, and A_1 $A_3 = A_2$ A will be slightly greater. Let also $h = A$ C, the height of the centre of gravity C of the float above A, the "centre of buoyancy" (centre of gravity of the displaced water). When the four caissons displace exactly equal volumes of water A is in the centre of the rectangle and at a depth below the water surface $= \frac{1}{2} d$. We shall then have $a = \sqrt{d\,h}$, approximately, so that the distances A_1 A_2, etc., between the centres of the caissons will be about $2\sqrt{d\,h}$.

(*c*). The proper length of scale-beam and corresponding weight of the "pee" L can be found thus: If a dynamo, or other machine absorbing energy, be mounted upon a "floating dynamometer" or on a "Brackett cradle," and driven by a belt or coupling, the "float" or cradle will tend to tip, and the tendency to tip, in connection with the speed of rotation, gives us a means of knowing the power absorbed. In fact, we have for the horse-power absorbed—

$H\,P = 2\,\pi\,L\,l\,N \div 33{,}000$; where

L = weight in pounds of the "pee" L.

l = distance in feet that L must be moved to counterbalance the "moment" or tendency to tip caused by running the dynamo.

In order that l may be read directly upon the scale-beam the latter should be graduated in feet and decimals thereof, and the float should be accurately balanced, so that the "pee" at the zero point of the scale-beam indicates a zero tendency to tip, which is done by moving the dynamo, or a loose weight, provided for the purpose, upon the platform until the bubble of the level E stands central, as will be further explained.

N = number of revolutions per minute.

$\pi = 3.1416$, or $2\,\pi$ is the circumference of a circle of one foot radius.

33,000 = number of foot-pounds per minute in a horse-power.

The weight L and the greatest value of l, which can be read upon the scale-beam, must therefore be such that when they are substituted in the above formula it will give the maximum horse-power which it is desirable to measure.

(*d*) The scale beam should be long enough to admit of a graduation reading to the smallest fraction of a horse-power desirable, or the beam may be double and the fractional parts may be graduated upon the second part of the beam. The graduation should also run a short distance back of the zero point. The level E should also be of a delicacy corresponding with the smallest divisions on the scale-beam and the sensitiveness to tipping should be adjusted to suit both. This can be secured by selecting a level, supposed to be sufficiently delicate, and trying whether the sensitiveness to tipping can be made such that any change of the "pee" is shown at once by the level. The level E' need not be so delicate. The levels should be fastened to the platform and means provided for a slight adjustment of E.

(*e*) Two adjusting weights P and P'' should be put upon the platform so that P may be moved at right angles to the dynamo shaft and P' parallel thereto. Let p and p' be the distances through which these weights can be moved and let q be the smallest distance through which it is desirable to move the dynamo, *i. e.*, the distance within which it is convenient to set it, W being the weight of the dynamo. We must now make these weights such that $P\,p$ and $P'\,p'$ shall be greater than $W\,q$; that is, we must be able to tip the float as much by moving P or P' as W would tip it in moving the dynamo a distance q. It is best, however, to have these weights two or three times larger than this calculation gives.

(*f*) A weight should be provided to counterbalance the tendency which the weight of the strut D may have to tip the float sideways, or P' may be made large enough to answer for this also. Two standard lines should be marked on the platform parallel to the two sides of the rectangle A_1 A_2 A_3 A_4, and therefore at right angles with each other, and these should be used in setting the levels E and E', the dynamo itself, and in tacking down strips to guide the weights P and P'; and the latter should be tested and the strips adjusted until a movement of P' has no effect upon the level E, and *vice versa*.

(*g*) The centre of gravity C of the float should be in the plane passing through the centre line of the dynamo shaft and A. When the float settles to its position of equilibrium C is necessarily vertically above A, but B may be slightly to one side. The dynamo shaft should be tested to see that it is parallel to the standard line, and then two equal weights, tied together, should be slung over the dynamo pulley and balanced crosswise by means of P'; if a tipping is shown by E,—A, B and C are not in line and C must be moved a little by moving P. This test should be made with the dynamo pulley in four positions, to allow for irregularities in the same. When this adjustment is completed and A, B and C are in the same vertical plane the weight of D and the belt, or the spring or weight of a driving shaft in line with the dynamo shaft and coupled to it, can have no tendency to tip the float. The bubble of E may now be out of centre, in which case it should be brought back by the adjusting screw alluded to under (*d*).

(*h*) In case the dynamo be driven from a shaft in line with it, to which it is rigidly coupled, B must, of course, be in the line of that shaft, which should be a level line, because making it level is the easiest way to bring the dynamo journals in line with those of the driving shaft. With level shafts the only adjustment of the float is to bring it to the right height, which is done by putting water into the tanks. When the right height has been reached couple the shafts and move P' enough to allow for half the weight of the projecting part of the driving shaft, as found by a rough calculation. The shaft being coupled the level E' should show no disturbance of the float sideways.

(*i*) For most work the whole apparatus can be set up without making any careful adjustments until the dynamo is ready to run. Then the zero of the scale can be tested by moving the dividing shaft slowly forward and again backward, and balancing the float each time while the shaft is in motion; if the "pee" stands at the same distance in front and back of the zero for the two motions the zero is right. Unless A, B and C are considerably out of line no error will result therefrom, and the experiment can be at once proceeded with. The only error possible from A, B and C being out of line would be caused by the friction of the driving and dynamo shafts in the journals of the strut, which may cause a very small vertical pressure at B when the dynamo is running with a crossed belt; this would be smaller than with an open one, because the driving shaft friction would act against that of the dynamo shaft, and in certain cases we should have no vertical pressure at B, as, for instance, with t

driving shaft the same size as the dynamo shaft and running at the same speed.

In place of a scale-beam and "pees," a mirror may be mounted on the float and observed by means of a telescope and scale, in which case the float would tip different amounts, according to the power supplied to the dynamo, and the amount of tipping would be observed by the telescope, and the power calculated therefrom. In this case the adjustments will need to be accurately made. With the scale-beam, "pees" and level *E* as the means of measuring the power, the only effect of the water is to hold up the float against gravity, so that, although it has been thought best to give the theoretical adjustments in detail, the apparatus does not require to be in nice adjustment in all the respects mentioned to give good results. If anywhere near right, the float will float and tip sideways into the proper position with respect to the driving shaft, and the results obtained will be good.

By closing the hose *G* connecting the tanks, the float will settle to position more quickly, but will not be so sensitive.

Some of the minor parts referred to in the description are not shown in the illustration.

An Important Patent on Multiple Arc Distribution.

Our readers will no doubt be greatly interested in the contents of a patent just granted to Mr. Thomas A. Edison as it appears to have a very important bearing on the multiple arc distribution of electricity. This patent, which had been granted in a number of foreign countries, was filed in the United States Patent Office over seven years ago and is but now issued.

Filed in 1880, two years before the first central station

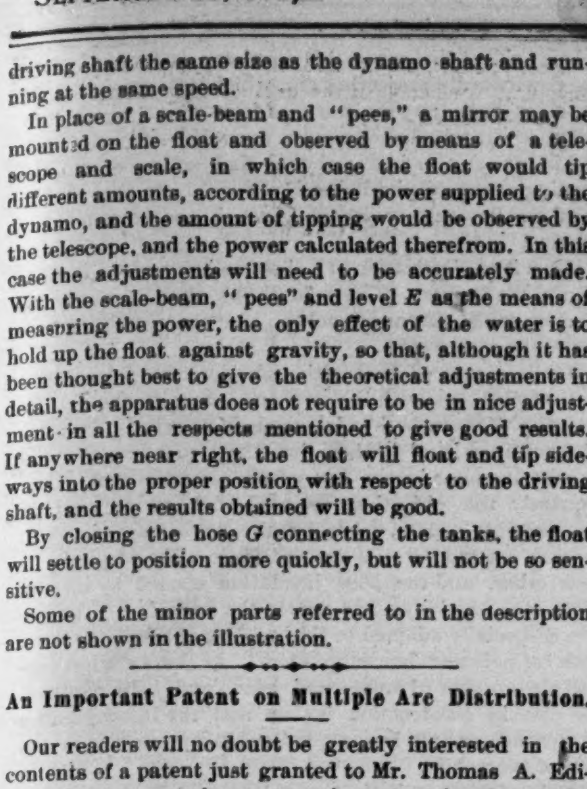


FIG. 1.—THE EDISON PATENT ON MULTIPLE ARC DISTRIBUTION.

for the distribution of incandescent light was put in operation, the patent naturally contains much that is obsolete to-day, but in its main features it corresponds almost exactly with the standard practice of the present time, and shows the depth to which the question of central station distribution had been entered into by Mr. Edison at that early period.

Mr. Edison had from the start set his mind upon the general house-to-house distribution of electricity, and as he recognized the difficulties and dangers to be overcome, he provided means and safeguards therefor. The prime idea embodied in the patent is the multiple arc method of distribution by a number of generators placed in multiple arc, feeding lamps, motors, etc., also placed in multiple arc, the whole forming a complete multiple arc system in contradistinction to the "series."

In the extract which we give below it will be noted that special reference is made to the means of securing uniform pressure throughout the system. The specification having been written at such a comparatively early date, it naturally contains expressions which appear quaint at this time, but we leave them unchanged so that our readers may trace the progress of electrical nomenclature. Some of the details of regulation are also very curious in the light of more modern practice. The following is the part of the specification relating to the accompanying illustrations, together with the claims:

In Fig. 1 three batteries of generation *C* C^1 C^2 are shown, which number may be increased or diminished as circumstances may demand. One generator *c* of each battery is used to generate the field of force magnets of the other machines in the battery, the circuit from such field generator through the field of force coils in each battery being shown by the broken lines 2 2 2. For actuating the rotating parts an engine *D* is used with each battery, connected by belt *d* to line of shafting *E*, from which belts *e* pass to the generator. The coils of each battery in which currents are generated are connected, as in C' and C^2, in multiple arc to conductors 3 3 3 3, which in turn are connected in multiple arc to the main conductors 6 6, from which lead in multiple arc the street conductors or mains 7 7, or as shown in part of battery *C*, each machine may be directly connected in multiple arc to the station conductors 6 6. *F* is the prime field of force generator, supplying the battery field of force generators *c c c*, its circuit being shown in broken lines 1 1. The field of force magnets of *F* are magnetized by a current from the galvanic battery *G*, in whose circuit is arranged the series of conductors *H*, provided with the cut-out *K*, by which more or less of the resistances are put in or out of

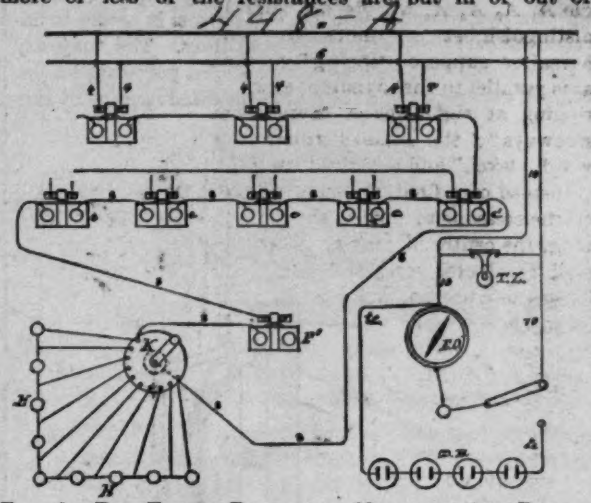


FIG. 2.—THE EDISON PATENT ON MULTIPLE ARC DISTRIBUTION.

the circuit feeding the field of *F*. This arrangement forms a very effective and simple method of regulating the production of current or the pressure at the central station, for the current generated by *F* being dependent upon the intensity of the magnetization of its field-of-force magnets, which in turn depend upon the current transmitted around the magnets by the battery *G*, as the resistance varies such current, it follows that by varying the resistance in the circuit of *G* the current generated by *F* varies, which in turn varies the current generated in *c c c*, which in turn varies the current generated in the supply-machines of the batteries, proportionate increase of current and rise of pressure in the latter following increase of current around the magnets of *F*, and *vice versa*. One or more test-lamps *T L* are placed at the central station in derived circuits to serve as a photometric test of the pressure in the lines. For more accurately indicating variations in the pressure, one or more electrometers, galvanometers, or electro-dynamometers *E D* are placed in derived circuits, with a scale mark indicating the pressure determined on as the standard pressure to be maintained. By the proper use of these indicating devices and the regulating devices described, a uniform pressure may be readily and easily maintained through all the mains. It is preferable to con-

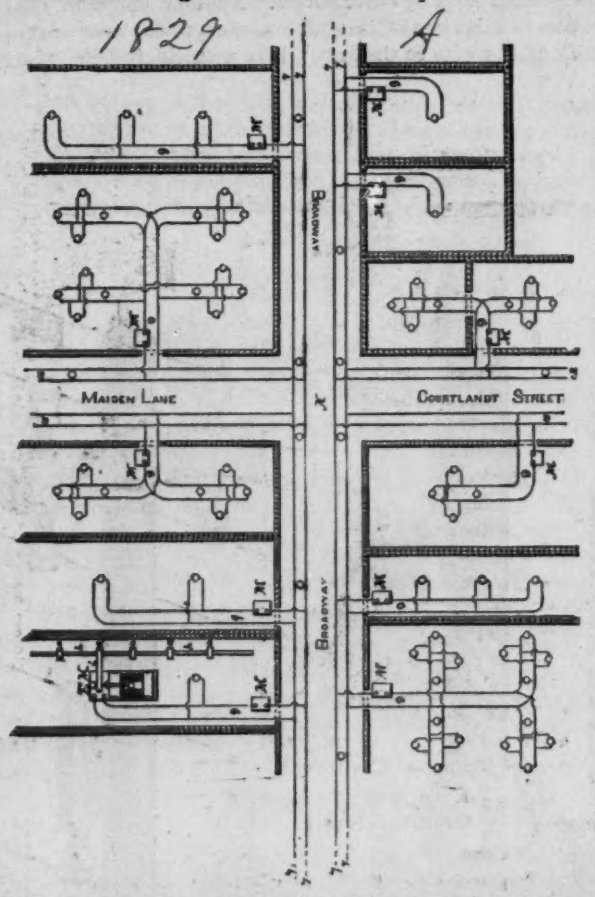


FIG. 3.—THE EDISON PATENT ON MULTIPLE ARC DISTRIBUTION.

nect all circuits from the generating machines to the main conductors 6 6 through switches *I I I*, so that an entire battery or any portion thereof may be thrown in or out of circuit, as the draft upon the station may indicate. It is to be noted, also, that the belt and pulleys of each machine are to be arranged by any of the well-known plans, that it may be disconnected from the motor when desired. These means may be used, when desired, as means of regulation, the number of machines in operation being controlled thereby, while the effective force of each machine while in operation is controlled by the resistances. The engines may be of any desired pattern or power, the number of machines in any one battery being limited by the power of the engine.

In Fig. 2, *c c c c* are the field of-force generators of batteries not shown, while *c'* is the field-of-force generator of a battery, of which three supply-generators are shown, connected to station-conductors 6 6, as before explained. The prime field-of-force generator F^v is in this case a dynamo-electric machine, instead of a magneto-electric machine, as shown in Fig. 1, all its coils being included in one circuit, 8 8, which passes around the field-of-force magnets of the battery generators *c c c c c'*. The same principle of regulation is used, however, the resistances *H* and cut-out *K* therefore being arranged in connection with the circuit through F^v, so as to cause variation in the tension of the current therein, as and with the result before explained. In this figure there is shown what may be used also in connection with the plan shown in Fig. 1—means of testing the electro-dynamometers *E D* or other indicating instrument used. From a standard Daniell battery *D B* a circuit *t c* may be formed around *E D* by means of the switch *L*, so that, when desired, the correctness of *E D* may be ascertained and any inaccuracies which might arise be guarded against.

In Fig. 3 the mains 7 7 are shown, leading from corresponding wires at central station (see Fig. 1) down each side of the street. At side streets conductors 12 12 branch off. The small circles *o* in this figure indicate electric lamps. For street-lighting they are placed, as shown, in derived circuits from the street mains. From the mains derived circuits 9 9 lead into houses, in which are placed at some suitable spot the meters *M*, through which one of the house-conductors passes, and by which the amount of electricity supplied to the house is accurately determined. Upon these house-circuits are arranged lamps on the multiple-arc system in such number, position and grouping as may be desired. In these circuits I also propose to introduce electromotors *E M*, for furnishing light motive power. From the motor a belt *i* leads to a line of shafting *h*, and pulleys *a a*, for any needed distribution of the power, or the belt *i* may pass directly to a sewing or other machine, a separate motor being used for each power-driven machine. Where motors are desired, each, preferably, should be made of a power proportional to the maximum work to be done. While the electrical tension in each machine is regulated at the central station, yet if the maximum load of work be diminished at any particular motor its speed would necessarily be increased. It also might be desired at times to diminish the normal speed of the motor. In order, therefore, that some determinate speed may be maintained, irrespective of load or work, each motor should be furnished with a governor. For this purpose I prefer a governor invented by me, and

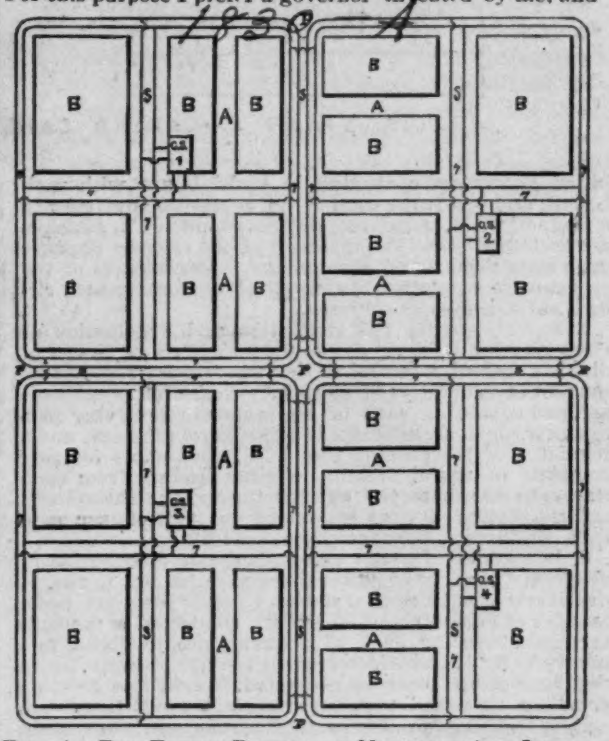


FIG. 4.—THE EDISON PATENT ON MULTIPLE ARC DISTRIBUTION.

to be the subject of a separate application, which acts to break the circuit when a certain determinate speed is exceeded.

In Fig. 4 is shown a locality divided into four supply districts. Each is provided with its own central station, marked *C. S.* 1, *C. S.* 2, *C. S.* 3 and *C. S.* 4. From each proper mains 7 7 lead out, as before described. At convenient points, however—say *P P*—connections between the mains of the systems may be made, the effect then being to merge the entire locality into one large district with four supply-stations, the pressure through all being uniform and each station doing its own quota toward maintaining the pressure uniform. The use of four stations and districts in this diagram is arbitrary and for illustration only, as the number actually to be made in any one locality depends upon the needs of the locality.

It is to be noted that all the circuits from the generators to the lamps or other translating devices are complete or round metallic circuits, as before stated.

The following are the claims:

1. In a system of electrical distribution, the combination, with a complete or round metallic circuit, of a number of generators connected in multiple arc with such circuit, and consisting each of an armature revolving in a magnetic field, and a number of translating devices, also connected in multiple arc with said circuit, substantially as set forth.

2. In a system of electrical distribution, the combination, with a complete or round metallic circuit, of a number of generators connected in multiple arc with such circuit, and consisting each of an armature of low resistance revolving in a magnetic field of great strength, and a number of translating devices, also connected in multiple arc with said circuit, substantially as set forth.

3. In a system of electrical distribution, the combination, with a complete or round metallic circuit, of a number of generators connected in multiple arc with such circuit, and consisting each of an armature revolving in a magnetic field and having the coils of its field of force magnet and its generating coils separate (*i. e.*, not connected in series), and a number of translating devices, also connected in multiple arc with said circuit, substantially as set forth.

4. In a system of electrical distribution, the combination, with a complete or round metallic circuit, of a num-

ber of generators connected in multiple arc with such circuit, and consisting each of an armature revolving in a magnetic field, a number of translating devices, also connected in multiple arc with said circuit, and a regulator for regulating the supply of current to such circuit, substantially as set forth.

5. In a system of electrical distribution, the combination, with a complete or round metallic circuit, of means for generating electricity connected with such circuit, and consisting of one or more dynamo or magneto electric machines, translating devices connected in multiple arc with said circuit, an indicator of the electric pressure upon such circuit, and a regulator under control of the operator for regulating the supply of current to such circuit, substantially as set forth.

6. In a system of electrical distribution, the combination, with a complete or round metallic circuit, of a number of generators connected in multiple arc with such circuit, and consisting each of an armature revolving in a magnetic field, translating devices connected in multiple arc with said circuit, an indicator of the electric pressure upon such circuit, and a regulator under control of the operator for regulating the supply of current to such circuit, substantially as set forth.

7. In a system for the generation and distribution of electricity for light or power through cities or towns or districts thereof, a central station whereat are combined a number of generators of electricity connected in multiple arc, and consisting each of an armature revolving in a magnetic field, an indicator of the electric pressure, and a regulator of the current generated, conductors forming complete or round metallic circuits leading from such station to distribute the current throughout the system, and translating devices connected in multiple arc with such conductors, substantially as set forth.

8. In a system for the generation and distribution of electricity for light or power through cities, or towns, or districts thereof, a central station whereat are combined a number of generators of electricity connected in multiple arc, and consisting each of an armature revolving in a magnetic field, an indicator of the electric pressure, and a regulator of the current generated, conductors forming complete or round metallic circuits leading from such station to distribute the current throughout the system, translating devices connected in multiple arc with such conductors, and meters at the houses for measuring the current supplied to such translating devices, substantially as set forth.

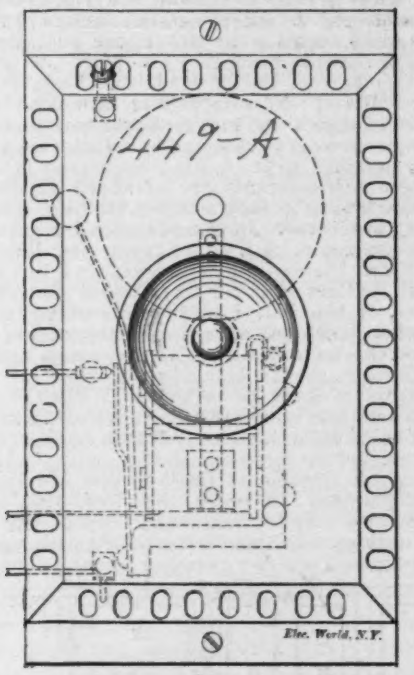
Electric Call Bell and Return Signal.

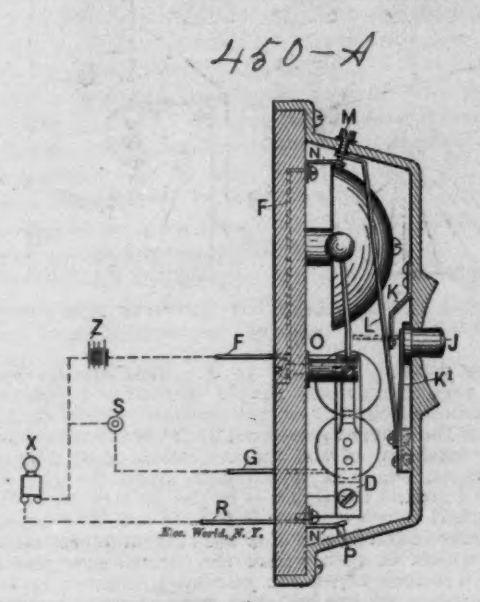
In many situations, such as offices or hotels, where call bells are employed to summon different persons, it is very desirable that the person calling should be in a position to know that the signal has been received and understood; or, in other words, that he receive a return signal. In order to accomplish this result with an apparatus of compact form, Mr. Franklin S. Carter, of Philadelphia, has designed the arrangement shown in perspective in Fig. 1 and in section in Fig. 2.

Within a metal cover there is placed the usual call bell, which can be operated from the push button *S*, and projecting from the centre is a push button *J*. To the inner face of the cover are secured contact springs *K* and *K'*, the spring *K* being directly connected to the cap and the spring *K'* being insulated by a block of hard rubber. The spring *K'* also serves to hold the push button *J* in place and to restore it to its normal condition after being operated. The spring *K'* is connected by a wire *L* to the screw *M*, which is insulated from the cap, and bears against a piece of metal *N* secured to the base. The spring *K* has electrical connection through the cap with the point *P*, where contact is made with metal strip *N'*.

The operation of the device is as follows: When the button *S* is pushed the current from the battery *Z* passes through the wire *F* to the contact standard *O*, thence through the armature to the electro-magnet, and out by the wire *G* back to the battery *Z*, thereby ringing the bell. When the push button *J* on the cap is pushed, the current from the battery *Z* passes through the wire *F* to the strip *N*, to the screw *M*, springs *K'*, *K*, through the cap to the point *N'*, to wire *R*, through bell *X*, and back to the battery *Z*, ringing the bell *X*.

To prevent the ringing of the bell during the time when the return signal is being sent, a projecting pin *S'* (shown in dotted lines, Fig. 2) is attached to the push button *J* and placed so as to come in contact with the arm of the bell-hammer, so that the movement of the same is prevented and consequently also the ringing of the bell.





FIGS. 1 AND 2.—CARTER CALL BELL AND RETURN SIGNAL.

The Brown Duplex Pin and Insulator.

Heretofore many devices have been resorted to for hanging wire to the under side of cross-arms in order to increase the carrying capacity of pole lines. The majority of these insulators, such as rubber hooks, porcelain knobs, etc., are expensive, and they have the disadvantage of supporting the line wires too close to the arms, with the result that the wires hang so close together that whenever there is a heavy wind the wires are in continual trouble and crosses are of frequent occurrence.

In addition to this, much difficulty is experienced in putting up these insulators, particularly in cases where the line is already constructed, it being necessary to bore a hole in the under side of the cross-arm, into which is screwed the hook or other device. Another common objection to this class of insulator is due to the near proximity of the wire to the arm; this attracts insects, who build their nests in and around the insulators, causing an ever increasing defect in the insulation of the line.

In order to avoid all these difficulties, Mr. R. G. Brown, electrician of the Standard Multiplex Telegraph Company, designed the duplex pin and bracket illustrated in the accompanying engravings. The oak pin shown in Fig. 1 is made longer than usual, so as to project some inches through the cross arm. A thread is cut on both ends, so that an ordinary pony or other glass insulator can be screwed on the top and a new glass insulator of Mr. Brown's design screwed to the lower end, as is clearly shown.

The lower insulator has an opening which extends centrally through it from top to bottom. The wall of this opening is screw-threaded throughout its length.

It is evident that when this insulator is screwed upon the downwardly-projecting pin, which is to sustain it upon the cross arm, any moisture, as from rain, which may fall upon the rounded or convex top will readily flow off, and in case any moisture should find entrance into the opening about the pin, its tendency will be to pass downward and flow out or escape through the bottom of the opening.

Fig. 2 is an illustration of a six-wire line such as is often seen in the country. One pole shows the present system of cross-arms, pins and brackets, and the remaining pole shows the new system.

It will be noticed that although the two poles shown are installed, one with the new and one with the old system, the wires on both poles are held at exactly the same distance apart, and further, that the under insulator and its wire are some inches away from the cross-arm. Consequently the objections pointed out as existing in the present system, whereby the wires are liable to become crossed by the fact of their close proximity to each other, and the poor insulation caused by insects, nests, etc., are impossible under the new plan. The system is specially adapted to the building of telephone lines, both for pole and housetop work. As there are but one-half the number of cross-arms, pins, and bolts required, the cost in construction is less and the line presents a lighter, neater and less objectionable appearance in the eyes of the public.

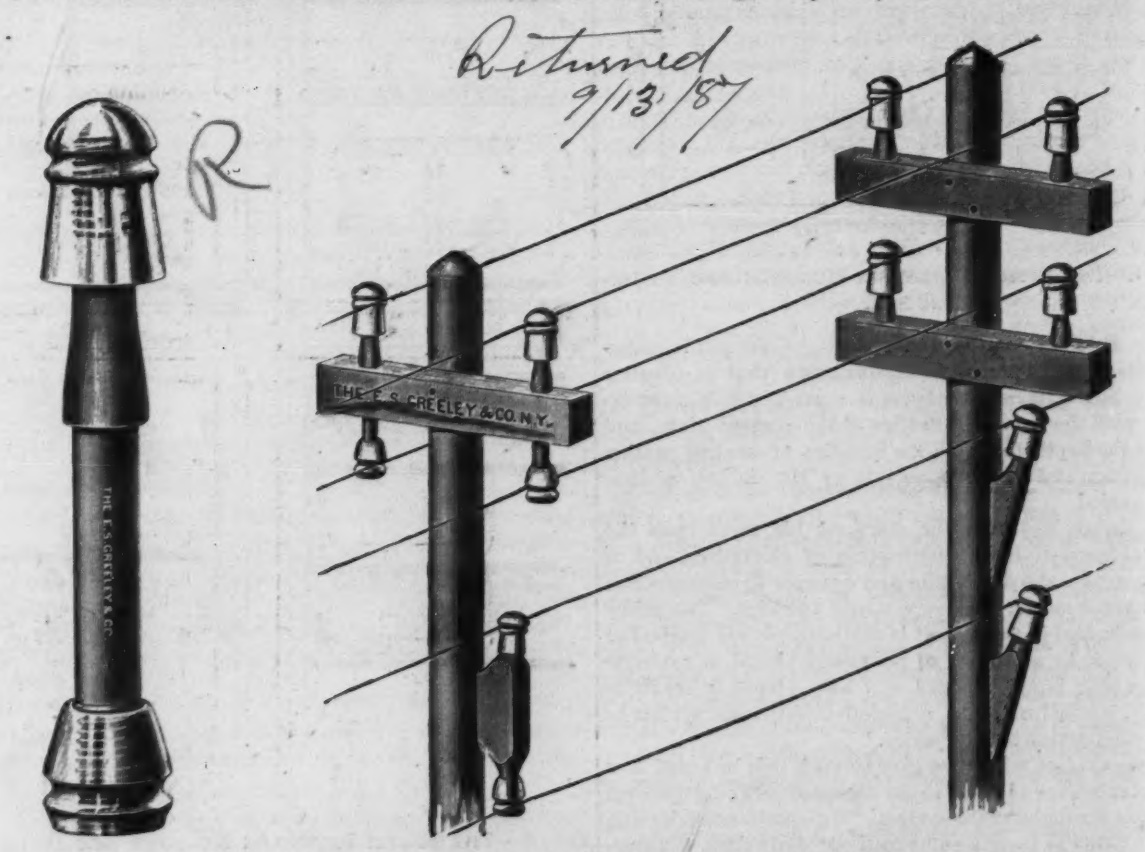
Taking for example the two poles shown in the drawing it will be seen that there is an actual saving of 1 cross-arm, 2 pins, 2 bolts, 1 bracket and 2 spikes; this on a single pole carrying six wires. But presuming the line to be an eight-wire line, say five miles in length, on the basis of 40 poles to the mile, the results would be as follows:

	Present system.	New system.
Poles	200	200
Four-pin arms	400	200
Bolts	800	400
Washers	800	400
Pins	1,600	800
Insulators	1,600	1,600

To the actual saving in material must be added the saving in transportation and labor on the same, which is an important item to be considered. The system offers a number of advantages in the construction of house-top lines. The "fixtures" can be made of a less number of parallel cross-pieces or cross-arms, which will permit of less expensive, lighter and more desirable fixtures.

It is evident that the carrying capacity of pole lines built on the present plan can be greatly increased and at a very low cost by means of the Brown duplex pin system, it being necessary to simply pull out the old pins and insert the new. The old insulator can, of course, be utilized on the top end of the new pins. The duplex brackets have been designed especially for cases where it is desired to build a two-wire line through woods, over house tops, etc., and both the pins and brackets for cutting-in purposes, test stations, etc.

The E. S. Greeley & Co., of this city, are now introducing this system.



FIGS. 1 AND 2.—BROWN DUPLEX PIN AND INSULATOR.

A Novel Use of Storage Batteries.—Johnson, Holland & Co. have made lately a novel use of batteries of the Electrical Accumulator Company in lighting up the Kiralfy open-air theatrical performances at the Chicago base-ball park. It was considered dangerous to use oil or gas, and resort was had to incandescent lamps run by the cells. The first time the plant was used the cells had been charged two weeks, but there was no trouble in the supply of current.

The British Association Meeting at Manchester.

Special cablegram to The Electrical World.

MANCHESTER, Eng., Sept. 5, 1887.—The meeting of the British Association at Manchester has been unusually interesting and the attendance has been very large. There were several American scientists present, and their participation in the proceedings was not infrequent. Among them I noticed Prof. Rowland, of Johns Hopkins; Young, of Princeton; Gray, of Harvard, and Langley, of Ann Arbor. Prof. Rowland took quite a brisk part in the electrical discussions. Of English electricians there was also a goodly gathering, and it included such men as Preece, W. Lant Carpenter, Swan, Fitzgerald, Forbes and Lodge.

The address of the President, Sir Henry Roscoe, did not make more than an incidental reference to electrical questions, but mentioned the researches of Joule, Maxwell, Faraday and Crookes.

Most of the electrical papers were presented in section A. Electrolysis was a leading topic, being treated by Dr Oliver Lodge, and the results of some original work were contributed from Owens College. Mr. Glazebrook presented a report on electrical standards and Professor Balfour Stewart one on magnetic observations. Mr. Preece, with his usual activity, put in no fewer than five electrical papers at this meeting, dealing respectively with the coefficient of self-induction in telegraph wires; the resistance of commercial iron; the induction between wire and wire: copper wire; fast speed telegraphy and the fusing current of different metals. Mr. Preece is vice-president of Section G, in which the last two and a number of other electrical papers were read, Section A being, however, that dealing specifically with electrical science. Sir William Thomson was a contributor to Section A, reading a paper on the application of his new balances in measuring the electromotive force of a single cell. Mr. A. P. Trotter read an interesting paper on the production of a constant current with varying potential, from a dynamo, and in the course of his remarks touched on the Thomson-Houston, Maxim-Weston, Hochhausen and Brush machines and the Bernstein lamp. Dr. Hopkinson also had a paper on dynamos. Mr. Killingworth Hedges discussed improvements in storage batteries. Prof. S. P. Thompson had a paper on the prediction of the tractive force of electro-magnets. Professor Lamb had a paper on electrical endosmose. Professor Ewing discussed certain points in regard to the magnetic permeability of iron, and Professor Schering sent in a paper on magnetism. Professors Thorpe and Rucker made a statement as to their new magnetic survey, and the Hon. R. Abercromby outlined a plan for closer observations of thunder-storms.

In the mechanical section Mr. Gisbert Kapp read a paper on the condition of maximum work obtainable from a given source of alternating electromotive force. On Saturday night Prof. Forbes lectured to the Manchester workingmen on the subject of the electric light.

This constitutes the major part of the electrical work done, and it will be seen to be very important. On the whole, the meeting is considered one of the best ever held by the Association. This is said to be due to the choice of Manchester, where it has always met with a hearty and warm reception. The Americans in attendance have received courtesies and kindnesses on every hand, and have not only renewed old acquaintanceships, many of which were formed when the Association was in America in 1884, but have made a very favorable impression generally. They will carry away many pleasant recollections of this meeting.

W. J. J.

The Thomson-Rice Voltmeter.

The use of permanent magnets as a controlling field in electric measuring instruments has been somewhat objected to on account of the so-called decay or loss of magnetism which is often observed.

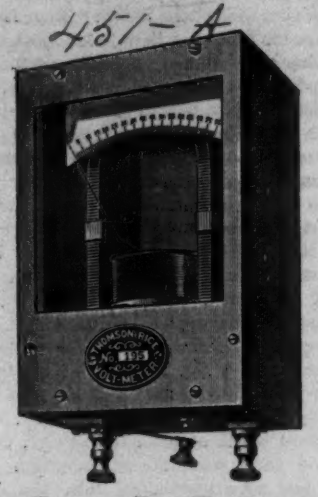
In order to determine this point exactly, Prof. Elihu Thomson and Mr. E. W. Rice, Jr., made a careful investigation into the cause of this loss, and they found that by careful selection of the steel and equally careful manipulation in its hardening, tempering, magnetizing and seasoning, a magnet could be produced in which the change, after six months of constant use, was inappreciable, less, in fact, than ¼ of 1 per cent.

With this result before them they have constructed a voltmeter, manufactured by the Thomson Houston Electric Company, which is designed especially with regard to portability, accuracy, and for long range indications, while being at the same time inexpensive.

The general appearance of the instrument is shown very clearly in the accompanying engraving. It is essentially a high resistance galvanometer, consisting of a thin disc-shaped needle surrounded by a helix of high resistance and placed between the poles of a powerful horseshoe magnet. The deflections are shown upon a scale by an index carried by the disc at right angles to its plane. The disc is made of soft charcoal iron carried by a steel axis supported in agate cups. The helix is wound with silk covered German silver wire to a resistance of over 1,000 ohms, which allows the highest potential for which the instrument is made to be kept on for some time without appreciable heating.

The instrument is neatly mounted in a strong, polished walnut case 6½ inches by 4 inches by 8 inches with plate glass front. The binding posts for making the proper connections and a key for closing the circuit when a reading is to be made, are placed upon the outside of the case.

The range is from 1 to 125 volts, but the instrument is usually calibrated from 40 to 120 volts. These calibrations



THE THOMSON-RICE VOLTMETER.

are made by comparison with a standard potentiometer in the laboratory of the company. We may add that 200 of these instruments are now in use.

The Peyrusson Storage Battery.

In a patent recently issued to M. Antoine Edouard Peyrusson, of Limoges, France, the latter describes a form of battery having a number of novel points. M. Peyrusson has found that the action of the battery, whatever may be its form or arrangement, is considerably increased if the electrolytic liquid contains cadmium or tin in solution, owing to the fact that in charging the accumulator these metals are deposited upon the electrode at the negative pole, and during the discharge yield a better result than lead or other metals. Cobalt, nickel or bismuth may also be similarly employed, but with less advantage than cadmium or tin, which are more electro-positive than lead and deposit more readily than acid solutions. These metals

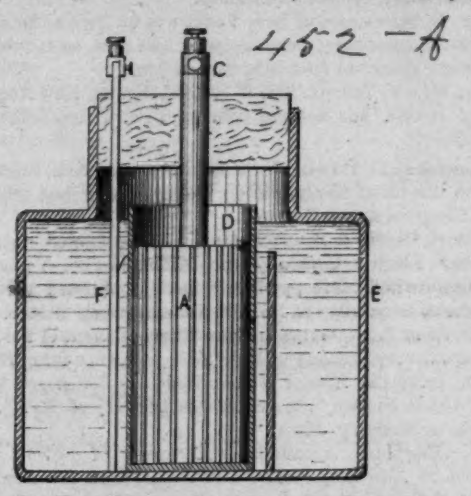


FIG. 5.—THE PEYRUSSON STORAGE BATTERY.

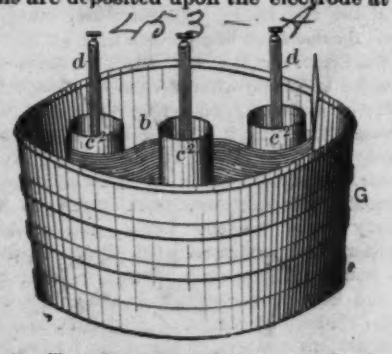


FIG. 6.—THE PEYRUSSON STORAGE BATTERY.

FIG. 1. FIG. 4. FIG. 3. FIG. 2.

THE PEYRUSSON STORAGE BATTERY.

may be employed in different forms, but the best results have been obtained with the following solutions, in which these metals are contained: Water, nine hundred; sulphuric acid, one hundred; sulphate of tin, three hundred. Water, nine hundred and fifty; sulphuric acid, fifty; sulphate of cadmium, three hundred. With these solutions the metal deposits readily. It is barely attacked when the circuit is open, but it is attacked with great uniformity when the circuit is closed. The addition of a little bisulphate of mercury to the above-mentioned liquids renders the action still more regular. As the action of the electrodes at the negative pole is derived mainly from the tin or cadmium which is deposited in charging, these electrodes may consist simply of conductive plates of carbon, lead, copper, tin or cadmium, either pure or alloyed with other and less oxidizable metals.

In the construction of his cells M. Peyrusson employs a lead support, Fig. 1, composed of a central rod *C*, a number of longitudinal and radial strips *A*, and a bottom plate *B* placed in a porous cup *D*, as shown in Fig. 2. The spaces between the strips *A* are then filled with peroxide of lead, or other material capable of producing the same by oxidation, which is mixed with a little water slightly acidulated with sulphuric acid. The longitudinal radial strips of the support may be replaced by spiral surfaces, as shown in Fig. 3, or by wires or points like a cylindrical brush, as shown in Fig. 4. The electrode enables the accumulator to be made in the form of an ordinary battery by placing the porous cup in a second vessel, *E*, of glass, which contains the electrode *F* of the negative pole, as shown in Fig. 5.

For large accumulators the inventor employs watertight barrels *G*, Fig. 6, in which is placed a positive of corresponding dimensions, or several small ones, c^2, united by simple plates of lead *b*, which surround the positives and form the electrodes at the negative pole, on which the tin or cadmium is deposited in charging. According to M. Peyrusson, tin is better suited than cadmium for accumulators with a porous cell, but cadmium is better for those in which the electrodes are immersed directly in the liquid.

To increase the duration of the electrodes at the positive pole, a part of the conducting-surface of the electrodes is protected by drawing with an insulating varnish vertical and horizontal lines two or three millimetres wide and about two millimetres apart. These lines form a reticulated network, which is protected from oxidation during a certain time, and which is said to increase the durability of the electrodes. For this purpose a varnish made of bitumen, gutta-percha, or other insulating material is used, or a solution of platinum chloride in essence of lavender. In the latter case, the network having been traced as above described, the metal is dried and the platinum reduced by submitting the electrode to the positive pole of a battery. The reduced platinum preserves the metal beneath from oxidation and increases the life of the electrode.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
NEW YORK, Sept. 5, 1887.

The leading theme in electrical circles during the last week has been the award of the new street lighting contracts. Some of the figures are very low, and they average about one-half of the old prices when the two large companies divided up the city. It is a pity to see rates so cut down. It shows, however, that there was a set determination in some quarters to get into New York and secure a footing there. The new East River Company has obtained quite a large share of the business. That and the North New York Company are both to have large Thomson-Houston plants, and the headway made by these two concerns is largely due to the unremitting work of Mr. J. J. Moore, who has put his whole soul into the struggle, and has shown himself as brainy and nervy a man as there is to-day in the business. He has done well for the interests he represents and has made a good start. Mr. Moore, by the way, was instrumental also in starting the new Thomson-Houston Company, at Buffalo, with a capital of $500,000, and with leading citizens in the management. And now that the contracts have been given out, perhaps we may see a move toward a better understanding on the subject of prices, and an effort to obtain the whole of the street lighting next year, on the basis and for the reasons already indicated by Mayor Hewitt.

Considerable dissatisfaction is being expressed in various quarters with regard to the appointment of Mr. T. Gilroy by Judge Donohue as the receiver for Mitchell, Vance & Co. The appointment is looked upon as wholly political, without any reference to the welfare of the property at stake. Ex-Judge Noah Davis, of the Supreme Court, does not hesitate to pronounce the appointment as illegal.

Rumors are still rife as to the settlement of the cable war. Meantime comes the news that Mr. Robert Garrett is dining with Mr. John Pender.

The Babcock & Wilcox Company are putting in the boiler outfit for the Sawyer-Man plant in the House of Representatives, and for the Sawyer-Man plant of the Electric Club in this city.

"Okonite" is said to be attracting a good deal of attention in England, where a reliable insulating material always finds a warm reception.

Mr. J. Thomson, late expert of the subway commission, is suing the board and the State Controller for $3,000 back salary. During the last two months the labor of providing underground accommodations for the wires has been prosecuted simultaneously in districts up town and down. On the west side of Broadway, from Seventeenth to Thirty-third street, 30 tubes have been laid, 6 for electric lights and 24 for telegraph and telephone wires. On the east side, from Twenty-first to Twenty-sixth street, 24 tubes for telegraph and telephone wires have been placed. Conduits have also been constructed in the cross streets from Broadway to Sixth avenue, below Twenty-third street, and from Fifth to Sixth avenue, above Twenty-third street. In the down-town district 140

tubes have been laid in Cortlandt street, from New Church to Broadway. At Broadway 70 were dropped, to be continued down that thoroughfare, and the other 70 have been extended up Broadway to John street, where 40 of them branch off, going down John street to cover the Nassau street district. The other 30 have reached a point nearly opposite Vesey street, and they are to be carried through Park Row to the Brooklyn Bridge. The construction Company has purchased the rights of the old Steam Heating Company, including its trenches, which will save considerable digging in placing the system in the Nassau street district. The new lighting companies are now on hand with request for pole line privileges, etc.

One of the most enjoyable days of the season was spent on Saturday last when the New York Electrical Society joined the Society of Amateur Photographers and the Photographic Section of the American Institute in a trip to Glen Island on the steamer "Blackbird." There were nearly forty cameras on board, and these were plied with ceaseless industry all through the sunny hours, catching "on the fly" all sorts of strange objects and many a pretty picture afloat and ashore. Mr. Leo Bock, Jr., the electrician of the Dakota Flats, took one electrical group which included Dr. Vander Weyde, Mr. Hamblet, of the Western Union time service, Mr. Jean Wetmore, Mr. Goold Levison, Mr. Wetzler and one or two others. A little later he was detected in the act of taking a "rear elevation" of the same party. The proceedings included an animated discussion of the merits of a genuine Rhode Island clam bake, and the party returned to New York well pleased with the day and its results. It is said that the photographers took about 25 pictures apiece. Some of these are to be shown at a meeting this week.

It is reported that Roebling & Sons are after a site, where they will put up a fine building to run through the block.

Mr. J. F. Kelly, representing the wire deparment of the Edison Machine Works, reports a very active demand for the wires, and a consequent increase of 100 per cent. in the factory facilities.

Bergmann & Co., the manufacturers of electrical apparatus, after trying for a year to run their shop nine hours a day with ten hours' pay, have given notice that they will return to the ten-hour system Sept. 12.

The Abendroth & Root Manufacturing Company, No. 28 Cliff street, this city, is full of orders, being now some 40 boilers behind its orders, and intends enlarging its shops for its increased business. Among the most notable orders received since January, 1887, are the Remington Paper Company, 540 horse-power; the Edison Electric Illuminating Company, Detroit, third order, 540 horse-power; Columbus Incandescent Electric Light Company, 369 horse-power; also many others. The total number of boilers sold since January to date is 76, horse-power, 8,775.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Sept. 5, 1887.

Messrs. Paine & Francis, New England agents Edison United Manufacturing Company, are installing an isolated incandescent plant of 100 16-c.-p. lights for Messrs. Conant, Houghton & Co., Littleton, Mass. The New England Wiring and Construction Company has charge of the wiring work.

Advices from Meriden, Conn., dated Sept. 1, gave the following announcement: "To-day the Meriden Gas Company and Meriden Electric Light Company were consolidated, with a capital of $250,000, with George R. Curtis of the gas company as president."

The Wainwright Manufacturing Company, Boston, reports recent shipments of its corrugated tube feed-water heaters to electric light companies and others as follows: New Britain, Conn., Schuyler Electric Light Company; Middletown, Conn., Schuyler Electric Light Company; Glens Falls, N. Y., Electric Light Company; Van Depoele Electric Railroad Company, Brooklyn and East New York, L. I., and Hewes & Phillips, Newark, N. J.

The prospect of the introduction of electric lights into the town of Hyde Park, Mass., is growing brighter. Dispatches to the Boston daily papers of recent date indicate that, notwithstanding the vote at the last town meeting against the adoption of electricity as an illuminant, there exists a determination among many of the most prominent and more enterprising Hyde Parkers to keep the important subject of electric lighting constantly before the notice of their fellow townsmen. The following special to the Boston daily *Globe* is a sample of the dispatches referred to:

The selectmen received, several days ago, two petitions for a town meeting which were identical, with the exception of the signatures. The articles in the petition and embodied in the warrant are as follows: "To see if the town will instruct its selectmen, or a committee to be appointed or chosen for the purpose, to contract for lighting the streets with electric and other lights for a term of five years, at an expense not to exceed $5,500 per year, and appropriate money therefor." Article 3 is: "To see what action the town will take in regard to lighting its streets with electric and other lights."

At Newport, R. I., on Aug. 30, an interesting series of tests and experiments with torpedoes were witnessed by the examining board for the torpedo station, Captain Stone, Lieutenant-Commander Snow and Lieutenant Ingersoll. In a number of the experiments electricity was used, and in every test the electric apparatus and instruments were found reliable, and gave thorough satisfaction. In the first experiment two spar torpedoes were exploded, sending barrels and huge columns of water into the air, but losing secondary spars, opening a seam in the boat and killing many fish. Two exercise torpedoes were next exploded from a rowboat by electricity, breaking in pieces the spar to which they were attached and throwing it into the air. A spar torpedo, improvised from an empty can filled with powder, lighted with fuses and sealed with pitch, was then successfully exploded to show how powerful a torpedo can be quickly manufactured without gun-cotton. A torpedo was next fastened to a chain of iron two inches in diameter, and exploded, breaking the chain with ease. An improvised mine filled with gun-powder instead of gun-cotton was also fired with success. A countermine of four torpedoes was sent out on a line and all four torpedoes exploded, two from a boat and two from shore. This experiment was to break an enemy's system of mines. The last experiment was that of shore defense, a mine sunk off shore being exploded by two batteries working simultaneously from shore. The experiments were all very successful and satisfactory to the board. The board also visited the engine-room, where the electric light dynamo was explained by one of the members of the class.

The following has been copied from the Winnipeg (Man.) *Call* into the Montreal papers, being a letter from W. H. Nagle on the subject of the Wallace telephone fiasco: "Your issue of yesterday morning contains the following item in its local columns: 'Wallace, the telephone man, who was going to perform wonders here in the way of reducing telephone expenses, but whose scheme flattened out very suddenly, is now in Montreal trying to organize a company there. The Winnipeg gentlemen who were induced to go into the scheme are now sorry they had anything to do with it, and Mr. Gibbons, who took a contract to string wires and erect poles, is minus a considerable amount through the failure of Wallace to carry out his agreements. The plant of the defunct company is now in Sheriff Inkster's hands, and has been advertised for sale. Would you kindly permit me, as one who knows whereof he speaks, to say that the scheme above referred to did not "flatten out" as you state, but that it was deliberately strangled. The said act of violence resulting so fatally was not perpetrated by Mr. Wallace either, but by those who were in a better position to do the deed, and who may have had seductive considerations for their conduct. Mr. Wallace shipped hundreds of dollars' worth of goods to this city, demonstrating, I think, his good faith and honest intention to carry out his contract, but notwithstanding this, the directors, or a small ring of them, positively refused an extension of a few weeks' time to complete the work. The opportunity to destroy the enterprise was, it seemed to me, promptly availed of. The stockholders put their money into the enterprise in good faith, and they were justified in so doing, for no scheme ever bruited in this city had brighter prospects of success. In conclusion, I will say this, that though Mr. J. H. Ashdown was a director of the Manitoba Telephone Company, and at the same time its treasurer, he, in my opinion, was instrumental more than any one else in bringing about results so unsatisfactory to the shareholders, and so unfortunate for the community."

Mr. L. Stieringer, of New York, was in Boston for a few days last week, combining business with pleasant social visits among his many electrical friends in this section.

Mr. Geo. F. Talcott, who is well-known in New England electrical circles, has become connected with the Julien Electric Company.

General E. C. Pike has been appointed the New England agent of the Cleveland Electric Motor Company and has offices at No. 197 Congress street, Boston.

Messrs. Claflin & Kimball have been appointed agents of the Mather Electric Company for Massachusetts, Vermont, New Hampshire and Maine, and they have established themselves in comfortable quarters at No. 143 Federal street, Boston.

Mr. John T. Moriarty, the New England agent of the Electrical Accumulator Company of New York, reports having received an order from the Edison Wiring Company for a set of storage batteries to be used in the extensive brewery of Mr. G. F. Burkhardt, at Roxbury, Mass.

The Electrical Accumulator Company of New York, represented in New England, as above stated, by Mr. Moriarty, has successfully completed the installation of its system of electric lighting from storage batteries on the new steam yachts "Susquehanna" and "Cora." The latter vessel is owned by Mr. J. A. Morris, of Westchester, N. Y.

The *Boston Herald*, in its morning edition of Aug. 30, contained the following: MILFORD, Aug. 29, 1887.—This afternoon William A. Hayward, manager of the Pulsion Telephone Company, invited the *Herald* representative and other newspaper men to inspect the operation of a private wire at North Milford. Messrs. Jerome Prince and Lemuel Millett, of Milford, have perfected the pulsion telephone after months of close study. They use no battery or electricity, operating through a wonderfully ingenious transmitter and a No. 18 taut copper wire. Mr. Hayward led the way to an apple orchard, where, 1,600 feet from the house, a single wire, with a loose end lying on the ground, was stretched from house to tree. One of the party went to the house and spoke through the transmitter, and an Associated Press agent took off his hat—a common straw—laid it on the wire, using it as a receiver, and held conversation in an ordinary voice. At the same time Mr. William Bancroft, of Hopedale, took hold of the wire between the two speakers, to prevent any vibration and also to conduct off a possible electrical current. This had no effect whatever. During the talk three others of the party also heard the conversation by listening in hats placed on the wire at the end of a stick placed against the tree limb to which the wire was attached. Mr. Hayward placed the line at the service of the party for tests. The newspaper men then arranged a test to discover the range of audibility. The *Herald* man held a stiff Derby hat against the wire near the tree, and carried on a conversation through the wire with the house, his associate meanwhile steadily retiring from the hat at right angles to the wire. When away 60 feet from the hat, the latter plainly understood the conversation of both, and at 78 feet could hear, but not distinguish, words. A whispered conversation was plainly audible. All this occurred wholly out of doors, and one-third of a mile from the speaker at the transmitter in the apple orchard. A brisk wind was blowing across the wire. This closed the experiments with the single transmitter and grounded wire. The party then went to an adjacent building to the unoccupied loft of which a wire from the first house was stretched, connected with the second transmitter. Ordinary conversation through the transmitter could be heard anywhere in the room. Whispers, singing, music, etc., were distinguished with great clearness. Mr. Prince left the transmitter, went out of the room and down a flight of stairs; and his conversation at that distance from the transmitter was very distinctly heard at the other end. The *Herald* man, standing in a yard, heard Mr. Prince clearly over the wire, although the nearest transmitter was 40 feet away in a direct line upstairs in an interior room. The above tests were tried by each of the party in turn. The transmitter contains a device for imparting to the tones of the voice a peculiar vibratory force, not only persistent, as against other vibratory forces, but easily controlled. From Mr. Hayward's office lines to North Milford, Hopedale and Upton will be constructed, and the most rigid tests that can be devised will be tried before it is presented to the public.

The board of directors for public institutions for the city of Boston have erected an almshouse on Long Island, in Boston harbor. This island is the only point occupied by any of the public institutions of this city which is not connected with telephone service. In order to connect the island named with the Boston telephone exchange it becomes necessary to lay nearly one mile of submarine cable. To ascertain the best method of laying this conductor the president of the board, Hon. John B. Martin, placed at the disposal of the officers of the telephone company one of the steam launches on Tuesday, Aug. 30, with the purpose of prospecting and investigating around the island referred to. It was decided, after a careful inspection of the divers ways in which it might be done, to run a cable from Deer Island to the eastern end of Long Island, across the broad channel at the entrance of the upper harbor. The cable will be laid at an early day.

Messrs. Sawyer & Blake, New England agents of the Sprague Electric Railway and Motor Company, of New York, report recent installations of Sprague motors for power purposes in this section as follows: 3 h. p. for F. Schuetzer, Jr., & Co., No. 8 Bosworth street, Boston; ½ h. p. for Temple Manufacturing Company, No. 4 Norfolk place, Boston; 1 h. p. for Messrs. Roberts & Ball, 46 School street, Boston; 1 h. p. for Messrs. Cushman & Co., No. 39 Temple place, Boston; 1 h. p. for Chester Manufacturing Company, 48 Bedford street, Boston; 1 h. p. for Messrs. Otis, Clapp & Son, No. 10 Park square, Boston; 5 h. p. for Mr. Albert Anderson, No. 21 Hamilton street, Boston; and ½ h. p. for Glen Shirt and Collar Company, No. 121 Tremont street, Boston; Messrs. Sawyer & Blake have also placed several Sprague motors in the city of Fitchburg, Mass., to be used for running printing presses, coffee mills and various kinds of machinery. They recently furnished a 2 h. p. motor to the Milford (Mass.) *Daily News*. The motor is used on the printing press and the current is supplied by the Milford Electric Light Company. The same firm have also sold a 1 h. p. motor to Messrs. Newton & Robinson, Hartford, Conn.

W. I. B.

PHILADELPHIA NOTES.

PHILADELPHIA, Sept. 5, 1887.

A dispatch from Omaha states that Ma Kie Chang, Imperial Envoy from the government of China, and two secretaries, and Count E. C. De Mitkiewicz and three secretaries passed through that city Saturday on their way to Philadelphia to conclude the agreement made by the syndicate, of which Wharton Barker is the head, and the government of China relative to the organization of banks, railroad and telephone and telegraph lines. The announcement of the concessions granted to the syndicate, including the telephone and telegraph franchise for a period of fifty years, has been confirmed through official sources of the Chinese and American governments, and, although no mention has been made of the matter, I am informed that the syndicate will also establish electric light plants on a large scale in the various cities, as their franchise includes this important feature. All the details will be arranged during the stay of the envoy, and we shall soon be able to record the establishment of American ideas in the Chinese Empire in every branch of trade and industry. The whole scheme is regarded as one of the most gigantic enterprises the world has ever known.

The sixth annual meeting of the American Street Railway Association, of which Thomas W. Ackley, President of the Thirteenth and Fifteenth Streets Passenger Railway Company, is president, will be held in this city on the 19th and 20th of October next. It is expected that the meeting will be the largest held in the history of the association. The question of motors for propelling street railway cars will be brought prominently forward and discussed. Mr. William Wharton Jr., of this city, will make a report on "Electricity as a Motive Power." Papers will also be read on "Cable Motive Power," "Motors Other than Cable or Electricity," "Roadway Construction," "Street Railway Mutual Fire Insurance," and "Practical Devices Useful in the Economical Management of Street Railways." The last annual meeting was held at Cincinnati.

It is probable that experiments will soon be made in the coal mines of this State with a portable electric lamp possessing the following features: weight, about three pounds; illuminating power, five candles; size and shape similar to present lamps used in mines; duration of light, ten hours; cost of repairs, charges of battery and material two cents for ten hours. These facts show that there is nothing to prevent its adoption as a substitute for the present lamps, and even for candles in many mines where they are still in use.

A despatch from Washington says: "The superintendent of District Telephone and Telegraph lines has made a report to the commissioners recommending that all remaining overhead wires be placed underground. He claims that a test of four years has shown the entire practicability of the underground system."

The streets of this city have presented a frightful appearance of late on account of their being torn up so often and in so many places at one time. The Keystone Electric Light and Power Company, the American Telephone and Telegraph Company and the Penn Electric Company are all working large forces of men in laying their wooden conduits, and it looks as though the network of wires will in a short time be beneath the surface. All of the companies are laying commodious conduits.

The sale of the Baltimore & Ohio express system, and the deal by which the railroad itself will pass into the control of other hands, has made it almost a certainty in the minds of well-informed people in this city that the telegraph line will soon be leased, thus doing away with a formidable rival of the Western Union. It is asserted that the telegraph department cost the road over $50,000 a month for some time after the low rates were established, and for this reason many of the stockholders desired either to lease the system or pool the business, so that instead of losing money the business might be placed on a basis that would, at least, make both ends meet. Nothing definite is known, although a positive and seeming official statement has been made that if favorable terms could be secured, both the telegraph and sleeping car privileges would be handed over to other parties. It is said, too, that before Mr. Garrett sailed for Europe, he gave to John W. Mackay, an option on the telegraph system which will not expire until Sept. 10, and the delay in announcing a disposition of it

gives considerable color to this rumor. Developments are awaited with anxiety, but it is very probable that the suspense will not last long, as it is more than likely that before another week rolls by we will know the full details of the deal now in progress.

The La Roche Electrical Company have replaced the several small dynamos which they recently placed in Vicker's and Weston's hosiery mills with a 700-light incandescent machine of their own make. This, I believe, is the largest machine ever turned out in this city, and Mr. La Roche feels justly proud of the success achieved by it.

James W. Queen & Co. report a splendid business in their new specialties in the way of test instruments, etc. It is a popular house.

I need hardly say that Shaw & Geary are piled up with orders for their new Norway iron bell. It has achieved a remarkable success, and the simplicity of its construction and the low price at which it can be sold bespeak for it still greater honors. E.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Sept. 3, 1887.

The Board of Trade decided by a majority vote a few days ago to give the directors discretion in serving quotations to outsiders, and this action together with the well known sentiments of President Wright has resulted in crippling the bucket shops all over the country. The Board of Trade at the last session of the Legislature secured the passage of a law with the object of driving these institutions out of business, but it is claimed that the spirit of the law has been violated in that each of them has employed a firm upon the regular Board. The income the telegraph companies have been receiving from these concerns has been of so large and profitable a nature that it has only been after two years of persistent effort that they have complied with the demands of the Board of Trade and refused to deliver quotations. Several times they have made seeming effort to do so but have as often fallen back into their old methods. It is now stated that the end has been reached. The wires were all removed from the bucket shops this week, and the city electrician aided in the work by putting on a force of eight men who cut all overhead wires put up, it is claimed, in violation of the city ordinances.

A view of the city of Lafayette, Ind., after the arc lights are on, would bring delight to the heart of electric light men. Over four hundred arc lights are in operation. Of this number the Brush Company, managed by a private corporation, run three hundred. The remaining one hundred are of the Thomson-Houston system, which is owned by the local gas company. The odd feature of this situation is that the Brush Company have a five years' contract for street lighting from the gas company, but the gas company, finding that electric lighting was profitable, besides cutting off so much of their revenue, decided to go into the electric lighting business in connection with their gas interests. Mr. J. T. Davidson is the manager for the Brush Company.

By the way, Lafayette has a fire-alarm repeater, the like of which is known in only one other place. It recently got out of order and puzzled the electricians of a Chicago concern some time. Finally another electrician was sent for, but upon his arrival he found that it had been put up by a Lafayette lawyer.

J. W. Powell, electrician for the U. S. Government and Inspector of Steam Plants for the Treasury Department, has been in the city for the past week making several alterations in the steam and electric light plant for the post-office and sub-treasury. After repairs had been made, all the lights were turned on with entirely satisfactory results.

The United States system is in use in this building. The steadiness of the engines and dynamo in this severe test was noticeable by all present. Mr. Powell uses the Edson steam gauge, by means of which he can keep a record of the steam pressure at all times, and in case of too high pressure an alarm is automatically given.

Mr. Powell has left for Philadelphia, to put in the electric plant in that city. He states that the Government has ordered that all buildings hereafter constructed be wired for electric lighting.

It is expected that before the week closes the West Side street railway system will pass into the hands of the Yerkes syndicate, who already control the North Side street railways. This action is regarded as gratifying from an electrical standpoint, as Mr. Yerkes is known to favor the electric road.

The Mayor of Lake View very unexpectedly vetoed the ordinance giving the Van Depoele Company the privilege of placing six miles of road in that city, although the necessity for better street railway transit has long been admitted. The Van Depoele people are confident, however, of securing its passage over the Mayor's veto.

The Van Depoele Electric Railway and Power Company has been incorporated with a capital of $2,000,000 for the purpose of purchasing the good will and street railway patents and plant of the Van Depoele Electric Manufacturing Company. The new company will proceed to at once build a new factory, costing not less than $500,000, and with the increased capital will be able to cover the field in a thoroughly satisfactory manner. Mr. A. K. Stiles, of the Van Depoele Company, is now in the East on business in connection with the new corporation. The company will equip the "White Line" of street railways in Dayton, O., with its system. The plant will consist of one mile of underground and five miles of overhead conductors, and the first order calls for fifteen cars. This line is controlled by Mr. Jno. Kilgore, the street railway magnate of Cincinnati, O.

A feature of the street railways systems this company has equipped has been the opening of suburbs and the lighting of the same by the arc light. For this purpose the Van Depoele Company has sold a 60-light plant to the Montgomery (Ala.) Company and a 60-light plant for Scranton, Pa. Efforts are being made to secure a franchise from the Milwaukee (Wis.) City Council for an electric street railway.

Mr. Forée Bain has sold to a Boston syndicate the exclusive right to sell his motors in the New England States and the State of New York. The remaining territory has been placed under the management of Mr. Cyrus Emery, Room 25, 115 Dearborn street. Negotiations are in progress, however, for the control of the entire United States by the same syndicate, in which case Mr. Emery will act as general agent. The Bain motor embodies good ideas, but like a great many valuable electrical inventions has lain dormant until sufficient capital could be secured to properly place it upon the market.

Mr. Delapoinaire, who looks after the Westinghouse interests in this territory, was in the city this week.

Mr. J. W. Dickey is now connected with Mr. Horne, Western manager of the Excelsior Electric Company, which has just sold a 45 arc-light plant for a large saw mill in Ludington, Mich. Probably 100 incandescent lamps will also be placed in circuit.

A new pin and bracket factory is talked of at Buffington, Mo.

The Cicero Water, Gas and Electric Light Company has been incorporated at Oak Park, Ill., with a capital stock of $65,000, by Edwin S. Conway, O. W. Herrick and Wm. M. Luff.

J. L. Sillsbee, the architect, is erecting a building to cost $80,000 for the Chicago Telephone Company at the northeast corner of Franklin and Washington streets. It is to be 40×90 feet and seven stories high. It will be fire-proof, and the interior columns will be of wrought iron instead of cast iron, as is usual in such structures. The first story will be of Waupaca granite and the remaining stories of pressed brick and terra cotta. The first story will be used mostly for storage purposes, and will be built with few openings, making the appearance massive instead of stilted, as is the case with many tall buildings. The Waupaca granite used in this structure is a strong and beautiful stone from Wisconsin, now being introduced in this city.

The city of Aurora owns its own electric light plant, and a local paper figures that it costs about 12 cents per lamp each night to light the streets, and there are seventy-four lamps.

Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes me with the following quotations upon telephone stock:

Bell of Mo.	$155@$157
Central Union	44@ 45
Chicago	385@ 400
Colorado	20@ 22
Cumberland	80@ 85
Great Southern	28@ 30
Iowa Union	25@ 27
Michigan	72@ 73
Missouri and Kansas	66@ 68
Rocky Mountain Bell	40@ 45
Wisconsin	105@ 107

C. H. M.

THE TELEGRAPH.

Georgia.—A bill to incorporate the Darien & Doboy Telegraph Company is before the Georgia Legislature.

T. M. B. A.—Assessment No. 210 has been made for September, to meet the death claims of F. J. Wrightman and C. H. McConnell. This assessment is due from members holding certificates up to and including Nos. 5673, B 24, C 6, and D 2.

The Western Union Withdraws Its Wires.—A dispatch from Chicago of Sept. 2 says: The Western Union Telegraph Company, in conformity with the demands of the officers of the regular board of trade, has at last withdrawn its wires from the floor of the open board of trade, thereby cutting off that concern from all communication with the regular board. In spite of this the open board disclaim any intention of quitting the business.

THE TELEPHONE.

The Erie Contract.—Erie telephone shareholders have unanimously approved the perpetual license from the Bell Company for its Northwestern territory.

Hopkinsville, Ky.—The South Kentucky Telephone Company has been organized at Hopkinsville with a capital stock of $30,000. Mr. J. M. Howe is president, Mr. C. F. Jarrett vice-president, Mr. S. H. Turner secretary and manager, and Mr. T. J. Morrow treasurer.

Suits at Pittsburgh.—At Pittsburgh, Pa., on Sept. 2, in the United States Circuit Court, the American Bell Telephone Company and the Central District Printing Company, of Pittsburgh, filed suits against the Johnstown Lumber Company, of Johnstown, Pa., and others, for infringing upon the patents of the company.

Augusta, Ga.—The local telephone exchange appears to be adding very rapidly to its constituency under the management of Mr. D. Murphy. The new list of subscribers to hand runs up to 200, and the number of applications for service are well maintained from month to month. It is said that every factory, bank, and institution in the city, as well as all the public offices, are on the list.

THE ELECTRIC LIGHT.

Sanford, Fla.—It is proposed to erect a Brush plant at Sanford.

Columbus, Miss.—The Columbus Oil Mills are putting in an electric light plant.

Raleigh, N. C.—Another dynamo is being added to the Thomson-Houston plant.

Athens, Ga.—A stock company is now being formed at Athens for electric lighting purposes.

Fenton, Mich.—The Fenton Electric Light Company has been incorporated with a capital stock of $10,000.

Greenville, S. C.—The Greenville oil mills are being overhauled, and it is proposed to put in an electric light plant.

Raleigh, N. C., Oil Mills.—The Raleigh Oil Mill and Fertilizer Company proposes to put an electric light plant in its works.

Salem, O.—Proposals are wanted for the electric lighting of Salem, and should be addressed to A. H. Harris, chairman of committee.

San Antonio, Tex.—The Alamo Electric Light and Power Company has been incorporated by J. C. O'Connor, H. D. Kampman, J. J. Stephens and F. Gross, with a capital stock of $50,000.

Anniston, Ala.—A representative of the Westinghouse Company is reported to have made a proposition to establish an electric light plant at Anniston.

Sheffield, Ala.—The Sheffield Electric Light Company has placed with the Sheffield Manufacturing Company a contract for the construction of its power plant.

Chicopee, Mass.—The Chicopee Electric Light Company has assumed the contract for lighting the town made with the Thomson-Houston company, and has begun work on its plant.

Sumter, S. C.—The cotton mill at Sumter, S. C., Mr. D. J. Williams, president, will probably have its electric light plant this winter, but at present no contract has been made.

Gouverneur, N. Y.—A company which intends using the American system has been formed at Gouverneur. Mr. E. D. Barry is president, Mr. W. F. Ludds vice-president, and Mr. C. A. Parker secretary.

Cooperstown, N. Y.—The Cooperstown Light and Power Company, Otsego, N. Y., has been incorporated with a capital stock of $20,000, by Messrs. J. W. Hule, Dudley Farlin, Chas. D. Hammond and others.

Valley Falls, Kan.—The Indianapolis Jenney Company has just put in operation for Mr. J. M. Piazzek, of Valley Falls, one of its new 100-light dynamos, with lamps, etc., making a complete and effective plant.

Griffin, Ga.—E. M. Walsh & Co. are awaiting the action of the Griffin town council, as to the nature of the electric light plant they put in, additional to that required for their own new ice factory and bottling works.

Palatka, Fla.—The Southern Gas Trust and Construction Company, with a large stock, has been organized in New Jersey by Mr. H. G. Payne, of Palatka, with the object of building gas-works, water-works and electric light plants.

Halifax, N. S.—The Gas Company, which had already an electric light plant of its own, has bought out the electric light company. It is reported that the price was $90,000. There is a likelihood that better prices will be had for city arc lighting, but new competition is cropping up.

Brooklyn, N. Y.—Justice Bartlett, on Sept. 2, in the Supreme Court, Brooklyn, refused to grant a mandamus compelling the Subway Commissioners to issue a permit to the Edison Electric Light Company to tear up the streets in order to bury its wires. The court thought the Commissioners had no power to grant such permission.

Port Chester, N. Y.—The Rye & Portchester Gas Light Company obtained a franchise lately for electric lighting. It is now getting estimates with a view to the construction of the plant at an early date. Mr. A. A. Carpenter is president of the company, Mr. J. W. McCarty secretary, Mr. W. Ryan treasurer, and Mr. J. D. Gunning, Supt.

Anniston, Ala.—Mr. H. D. Garden, of the Sawyer-Man Electric Light Company, says if Anniston will take $10,000 in a $30,000 company, his concern will put in a plant here and supply plenty of arc and incandescent lights. So said Mr. Keith yesterday. Anniston needs more light; is badly in need of cheap light, and ought to be accommodated.—*Hot Blast.*

Northampton, Mass.—As stated in our last issue, the local electric light company has made a contract with the city authorities to light the City Hall with 53 incandescents and 3 arcs; 2 of the arcs are to go in the main hall. The city will pay $225 a year for the bulk of this lighting, and by the night for the hall lighting. Northampton has now 58 miles of electric lighting circuits.

Rochester, N. H.—The Gonic Manufacturing Company, at Rochester, has the matter under consideration of introducing electric lights into its mill the coming winter. If the project is carried out, says the Concord *Patriot*, the plant will be made at the saw mill situated about an eighth of an mile below the company's mills, where there is ample supply of water to furnish the power needed.

La Crosse, Wis.—The Marr Construction Company has recently put in operation an Edison plant at La Crosse, Wis., using two 150 h. p. Beck engines, built by the Taylor Manufacturing Company of Chambersburg, Pa. The work of the engines is very highly spoken of. Each drives one pair of dynamos, with a capacity of 1,200 lights. The power is entirely interchangeable, so that either or both engines may be employed in supplying power as required. The company has already 2,500 lights in use by permanent customers, and the plant is a good investment for its organizers.

Kennebec, Me.—The Kennebec Light and Heat Company has closed a contract with the Edwards Manufacturing Company, Augusta, for the furnishing of 300 horse-power for the purpose of running electric light dynamos. A wheel will be put in the east end of the dam and a station building erected. Both systems of electric light will be introduced, the arc and the incandescent, the former for street lighting and the latter for residences. At the next meeting of the Augusta city government a petition will be presented from the company asking for the privilege of erecting poles in order to furnish the light for any part of the city. The company has already made contracts with several large concerns to furnish them with the electric light.

APPLICATIONS OF POWER.

Coney Island.—It is stated that the Brooklyn & Coney Island Railroad, which operates a horse-road from the Brooklyn city line to Coney Island, will reconstruct its road-bed before next season, and will substitute electric motors for its horses.

The Mayall System.—The Mayall Electric Elevated Railway Supply Company has been incorporated, with a capital stock of $2,000,000. Mr. T. J. Mayall, of Reading, Mass., is President and Mr. F. H. Raymond, of Somerville, Mass., Secretary.

Columbus, O.—The new electric railway at Columbus, O., is constructed upon the series system of Prof. John H. Short, of Denver, Col. Two trains of cars will be run. The cars wil

have a carrying capacity of 120 passengers each. The speed will be about ten miles per hour.

Memphis, Tenn.—The Jackson Mound Park Railroad Company has recently been organized, with a capital stock, all subscribed, of $100,000. Mr. H. Cummins is president, Mr. S. Coleman vice-president, Mr. T. Krekel secretary, and Mr. J. W. Cochran treasurer. The road will be six miles long, and there is talk of operating it electrically. Work on it is to begin about Oct. 15.

Mansfield, Ohio.—The Mansfield Electric Street Railway Company writes that it has now had its Daft road in operation for two or three weeks, and that it is having excellent success, mechanical and financial. Mr. Edward Oothout is president of the company, Mr. H. Brown vice-president, Mr. M. Van Rensselaer, Jr., treasurer, Mr. C. E. McBride secretary, Mr. Knight Neftel engineer, and Mr. W. G. Root general manager.

Appeton, Wis.—The Appleton Electric Street Railway Company, operating on the Van Depoele system, has now been running successfully for over thirteen months. It has to-day five cars in use. Each car makes fifteen trips on the main line, three miles long, or a round trip of six miles, which is ninety miles a day for each car. Judge Harriman, president of the company, says they are well satisfied with the electric system, and are quite positive that it would cost twice as much to run the same number of miles with animal power.

The Fulton Street Railroad.—The North & East River Railroad, popularly known as the Fulton street electric road, has been delayed in its construction. Colonel Hazard, chairman of the executive committee, said last week that they hoped to complete it about the 15th of October. The delays have been due to the electric light junction boxes, the sewer-heads and the pipes of the water and steam-heating companies. These companies are removing their pipes at the railroad company's expense, but have been unavoidably delayed in obtaining materials. The removal of the sewer-heads has been very expensive. The engines, cars, boilers and machinery of the road are completed, and as soon as the obstructions in the streets are cleared the road will be rapidly finished.

A Philadelphia Company.—Mr. H. B. Apple, of Philadelphia, sends us the following: "The Electric Car Company of America, has recently taken a prominent position. It is the outgrowth of the Hunter Electric Company, of Pennsylvania, which was incorporated some months ago with $100,000 capital, but has changed its name as above, and increased its capital stock to $2,500,000, retaining the same president, Mr. Wm. Wharton, Jr., who is so well known in railway circles, and who has been operating the electric street car in Philadelphia lately. Wharton Barker, of Barker Bros., bankers, who is identified in the Chinese Improvement Company, is treasurer. The company has bought out the works of the Wharton Railroad Switch Company, in Philadelphia, which covers a square, and has already erected its experimental tracks, etc. The company has also secured the inventions in electric railways of Mr. Rudolph M. Hunter, M. E., of Philadelphia, and Mr. Anthony Reckenzaun, the widely known electrician of Europe, and is licensed under many other patents. The company will erect all three systems, viz.: Overhead conductor, storage battery, and slotted conduit, as well as equip railroads complete either for surface, elevated or underground. It will also manufacture a new and improved storage battery which has been thoroughly tested in Europe, and will make its own motors and dynamos and all apparatus used in connection therewith."

MISCELLANEOUS NOTES.

Lightning Freaks.—It is stated, from Hillsdale, Mich., that a farmer there, during a thunder-storm, went into his back yard to frighten away some fighting cats. Just at that moment the place was struck by lightning, and the farmer fainted. When he came to, his wife exclaimed that the devil had set his mark on him. The farmer looked into the glass, and found the lightning had imprinted a silhouette of a cat on his broad forehead. All efforts to wash out this photograph are unavailing. Another despatch from Oswosso, Mich., states that a house there was struck by lightning and completely shattered without any injury to the eight persons who were eating supper in it. The lightning destroyed every picture in the house, turned the bed topsy-turvy, and wrenched off a single pedal from the melodeon, leaving the rest of the instrument untouched.

PERSONALS.

Mr. E. H. Goff.—It is stated that Mr. Goff is going to Europe to witness the unveiling and lighting of a miniature statue of liberty.

Major John B. Powell, general manager of the Brush Swan Electric Light Company of New England, has tendered his resignation.

Mr. C. L. Edgar, of the Engineering Department of the Edison Company, has been appointed manager of the Edison Electric Illuminating Company of Boston, vice Mr. W. J. Hammer, resigned for other work. Mr. Edgar took charge last week.

Mr. O. W. Stager, who has been for many years superintendent of the Philadelphia, Reading & Pottsville Telegraph Company, with headquarters at Reading, Pa., has been promoted to the position of assistant superintendent, main line division, Transportation Department, Philadelphia & Reading Railroad, with headquarters at Broad & Callowhill streets, Philadelphia. The skill and ability that he has shown in the telegraph department no doubt will lead to his promotion in the new field. He has been connected with the Philadelphia & Reading Railroad since the 60's, first as a telegraph messenger, until step by step he reached the position of superintendent of the telegraph system. Mr. E. R. Adams, who was his assistant, will succeed him as superintendent of telegraph.

Gen. E. S. Greeley, of The E. S. Greeley & Co., entertained at Frink's, Stony Creek, Connecticut, the veterans of the Tenth Regiment, C. V., on September 1, when a most enjoyable day was spent, closing with a concert and a banquet. The Tenth entered the United States service September 21, 1861, and was mustered out of service August 25, 1865, under command of General Greeley. Among the important actions which this regiment took part in were those of Roanoke Island, Kingston, White Hall, Goldsboro Ridge, North Carolina; siege of Charleston, Deep Bottom, Darbeytown Road, Chapin Farms, Richmond, Strawberry Plain, Hatch's Run and Petersburg. The regiment was at Appomattox at the time of Lee's surrender.

BUSINESS NOTICES.

Jordan & Gottfried, 208 Canal St., N. Y., carry a complete stock of iron and brass machine and wood screws, bolts cap and set screws, taps, dies, files, twist drills, brass and rubber in tubing, rod and sheet copper, brass, German silver, steel and iron wire, shafting, tools, etc.

The Beck Engine is a high-speed automatic engine, built especially for the operation of electric light plants by the Taylor Manufacturing Company, of Chambersburg, Pa. It is in use by the Canton, N. Y., Electric Light Company on their Thomson-Houston plant; by the People's Electric Light Company at York, Pa., and by the Edison stations at Altoona, Pa., Focomoke City, Md., and Cumberland, Md. It is economical in performance, runs smoothly and is durable in all its parts. It has a new automatic cut-off regulator insuring a very high degree of perfection in regulation. The valve is also perfectly balanced, it is claimed, and is so proportioned as to effect a great reduction in the consumption of steam.

STOCK QUOTATIONS.

The following list, compiled by Mr. W. H. Baker, member New York Stock Exchange, 16 and 18 Broad street, gives the current quotations of electrical stocks:

Sept. 6, 1887.

TELEGRAPH.	Bid.	Asked.
Am. Dist.	.....	35
Am. Tel. & Cable	70	73½
Cen. & So. Am.	100	110
*Com. Tel	.....	.....
*Gold & Stock	.....	.....
*Inter. Ocean Tel.	.....	.....
N. Y. Mutual	75	80
Pac. & Atl.	49	56
*Postal T. & C.	28	32
South. & Atl.	72	80
W. U. Tel.	78⅛	78¼
W. U. Scrip.	.....	.....
W. U. Bonds	116½	.....
Mut. U. Bonds	85	86
TELEPHONE.		
Am. Bell	221	222
Am Speaking	105	120
Erie	34⅛	35
*Hudson River	.....	58

TELEPHONE.	Bid.	Asked.
Mexican	1	1¼
*N. Y. & N. J.	.....	90
N. Y. & Pa.	.....	.....
New England	41¾	42
*Southern Bell.	125	130
ELECTRIC LIGHT.		
*Am. Electric	34	42
*Brush	89	.....
*Brush Ill.	.....	91
*Consolidated	.....	.....
*Daft	.....	.....
*Edison	.....	205
*Edison Ill	85	.....
*Edison Isolated	.....	.....
*United States	.....	.....
*U. S. Ill.	86	.....
MOTOR.		
*Daft	.....	.....
*Sprague	.....	.....

* These stocks are so seldom dealt in that it is difficult to give prices at which they can be bought or sold. The figures given are as near as can be ascertained.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED AUGUST 23, 1887.

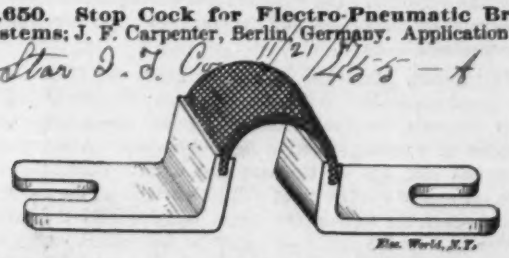
368,576. Conduit for Electric Railways; F. Euphrat, Boston, Mass. Application filed May 7, 1887. The conduit consists of a tube of insulating elastic material carrying the conductor. The tube has a longitudinal slit, through which the contact brush of a motor projects, and after passing along the tube closes and thus maintains the wire effectually insulated. See illustration.

368,596. Electrical Resistance; W. H. Knight, New York, N. Y. Application filed March 18, 1886. A series of metallic plates in superficial contact and a movable contact device to sweep over the edges of the plates in order to bring any number of them into circuit. See illustration.

368,608. Secondary Batteries or Accumulators; A. E. Peyrusson, Limoges, France. Application filed March 19, 1886. See page 145 this issue.

368,628. Telephone; H. L. Todd, Washington, D. C. Application filed Sept. 28, 1886. The object is to provide a transmitter which will send sounds of any pitch over long distances.

368,650. Stop Cock for Electro-Pneumatic Brake Systems; J. F. Carpenter, Berlin, Germany. Application filed



368,765. SAFETY CATCH FOR ELECTRIC CIRCUITS.

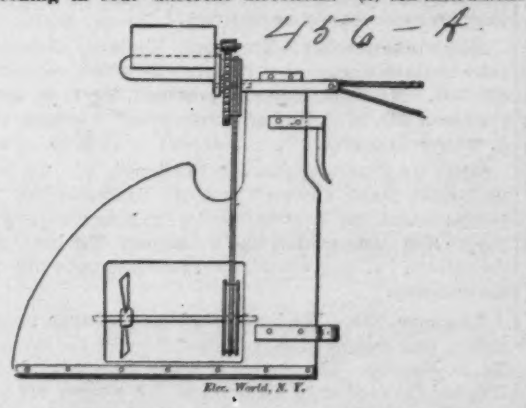
April 8, 1887. A stop cock having permanent conductors arranged in its shell around its plug and provided with contacts adapted to make connection with the terminals in the couplings.

368,654. Electric Hose Coupling; E. H. Crosby, Boston, Mass. Application filed May 24, 1887. By means of this device a boseman may signal the engineer. Insulated wires are run through the hose and a novel coupling is employed.

368,674. Electrical Apparatus for Voiding Water Pipes; J. W. Kent and R. Orr, of Brooklyn, N. Y. Application filed Dec. 11, 1886. Electricity is used to automatically turn water off from house pipes when the temperature reaches the freezing point, and to turn it on again when there is no danger of freezing.

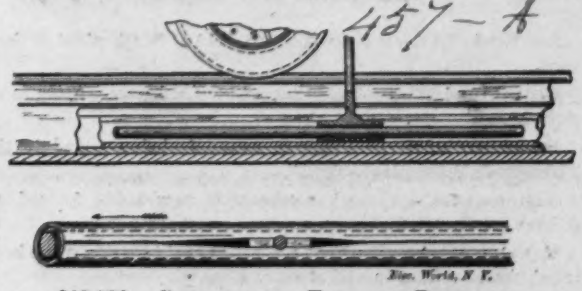
368,689. Controlling Device for Clocks; W. S. Scales, Somerville, Mass. Application filed Nov 15, 1886. A movable centering device controlled preferably by an electro-magnet is employed, which co-operates with the sleeve carrying the second hand of the clock, such centering device, when actuated by the magnet, moving the sleeve independent of the rotary motion imparted to it by the motor, thereby setting the second hand in a determinate position.

(1) 368,692. (2) 368,858. (3) 368,859. Printing Telegraph; R. J. Sheehy, New York, N. Y. Applications filed, respectively, March 24, 31 and 24, 1886. (1) The type-wheels are revolved by an armature, supported upon a universal joint and rocking in four different directions. (2) An instrument



368,796. PORTABLE ELECTRIC PROPELLER FOR BOATS.

actuated by currents transmitted over a single main line. Impressions are effected from either of two type-wheels through the agency of two electro-magnets, one being employed for controlling the positions of the type-wheels and the other for



368,576. CONDUIT FOR ELECTRIC RAILWAYS.

effecting the impressions. (3) This instrument is adapted to print letters in one line and figures in another, and the type may be moved out of the plane in which they usually stand.

(1) 368,764. Connecting Device for Electrical Conductors; (2) 368,765. Safety Catch for Electrical Circuits; W. J. Hammer, Boston, Mass., Assignor to himself and Francis R. Upton, of Orange, N. J. Applications filed respectively Feb. 16, 1887, and March 25, 1887. (1) A sleeve made in two longitudinal halves, with split tapering screw-threaded ends. (2) The object is to construct fusible strips so that they will not be injured by expansion and contraction due to changes in temperature. See illustration.

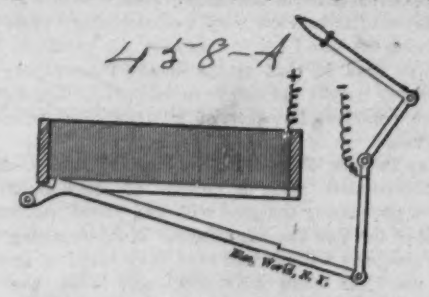
368,766. Support for Electric Conductors; M. J. Hart, New Orleans, La. Application filed April 5, 1887. Metallic towers extending above the roofs of buildings and suitably braced serve as supports for the wires.

368,796. Portable Electric Propeller for Boats; G. Trouvé, of Paris, France. Application filed Sept. 18, 1884. A propeller and a motor for operating the same are removably mounted at the stern of the boat. See illustration.

368,804. Electrical Resistance Coil; C. D. Baker, of Chicago, Ill. Application filed Nov. 24, 1886. The coil is wound upon a tube of non-conducting material in order to hold it in place.

368,806. Electrical Battery; T. W. Bryant, Ansonia, Conn. Application filed April 18, 1887. The zinc is placed inside the porous cup, which allows the cell to be more compact and the cup to be of less diameter.

368,809. Combined Electric Receiving and Transmitting Device; F. S. Carter, of Burlington, N. J., Assignor



368,596. ELECTRIC RESISTANCE.

to Partrick & Carter, Philadelphia, Pa. Application filed June 12, 1886. See page 144 this issue.

368,867. Electric Safety Lamp for Use in Mines; M. Settle, Snow Hill, Darcy Lever, County of Lancaster, England. Application filed Nov. 2, 1886. The lamp is supported on a float in a liquid and air tight vessel. Contacts are on the lamp and on the float, so that when the vessel breaks and water escapes, the lamp is cut out.

368,907. Fire Alarm Telegraph Repeater; C. Burgher, Boston, Mass., Assignor to the Automatic Fire Alarm and Extinguisher Co. (Limited), of New York. Application filed June 12, 1886. This repeater has a series of circuit closers and a corresponding series of controlling mechanisms therefor which are set and started by hand. They then act in succession upon each other to transmit or repeat the determinate set of number signals until the mechanism runs down or is stopped.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had from this office for 25 cents. Give the date and number of patent desired, and address Johnston's Patent Agency, Potter Building, New York.